GAS JOURNAL, JUNE 3, 1942

VOL. 238 94th YEAR No. 4124

EDITORIAL NOTES

THE POST-WAR HOME

WE have referred two or three times in these columns during the past few months to certain of the Papers comprising a series of twelve on the post-war home arranged by the Royal Society of Arts and held during the 1941–42 session. The last of the series was given last week. It was by Mr. Alfred Bossom, a prominent architect and also a politician, and was really a summary of some of the high lights of previous Papers, a focusing of some of the views expressed. At the outset of the series we said how desirable it was that the Gas Industry should follow the discussions closely, noting the trend of thought. We have attended several of the lectures, and we have never been so impressed by the need which exists to-day for co-operation between the architect and builder and the Gas Industry. We know that this is no new theme, that this doctrine of co-operation has been preached for years, but we are left with the feeling that this co-operation has not been established to anything like the degree necessary in the interests of the public who pay architects' fees and gas undertakings' accounts. If we have a general criticism it is that architects have concentrated on house design rather than the building of homes providing economically convenient and healthy means for warmth, including, of course, cooking and water-heating facilities. The Gas Industry has much to learn—and so has the architect, whose outlook must not be confined within the walls of a highly professional, watertight compartment. Whether or not the architect is prepared to acknowledge it, he does need the Industry's help—one phase only, of course, of a wider co-operation between all concerned in providing healthy, convenient, and comfortable homes.

To the self-imposed query whether the discussions have been gainful we should answer yes without hesitation. They have, we think, been helpful in a negative but also in a positive way. They have pointed mercilessly to the state of confusion which enshrouds the housing problem, to the debris of obstructive legislation and by-laws which must be cleared away; to the need for formulating clear-cut plans and agreed procedure on broad lines, to what could be accomplished by forethought and co-operative organization. That some of the hopes expressed may prove but pious and some of the thinking may turn out to be merely wishful is no doubt inevitable. The problem is there and the difficulties will have to be met, and it stands out a mile that some ways of overcoming them are better than others, that we cannot afford to repeat past failures because piecemeal attempts at solution are more facile, and that, above all, an essential is co-operation between all concerned—and "all concerned" includes not least the Gas Industry, which has so much to offer and must associate itself in this social development. We think that the extent of the services which the Industry could provide in homes planned for these services is not appreciated by the architect; the Royal Society of Arts lectures of 1941–42 have reinforced this view, and it seems to us that in this respect they have pointed a moral.

It is not that we expect on the part of architects (men and women) breathless excitement when gas happens to be mentioned, but we should like to see some show of interest if not of enthusiasm. The architectural profession and the Gas Industry are fairly old established and both have made glaring mistakes. Past interior fitting work is no credit to the Gas Industry, and many exterior elevations of houses are no credit to architects—and still less are many interiors of houses. Neither the Gas Industry nor the architect has sufficiently considered the occupier of a house, who maybe has not made his wishes known but dislikes the architectural design of his house and dislikes equally the haphazard, unwieldy, and ugly methods which gas undertakings have seen fit to countenance in connecting gas appliances to gas supply pipes. It seems to us that neither the architect nor the Gas Industry has been prepared to see far beyond each other's nose, and that the architect has imagined himself to possess a large nose. Acute listeners-in to the Royal Society of Arts lectures must have felt that architects, in common with gas and water suppliers, are fallible. The time is ripe for co-operation, for the architect not just to show but to extend his hand.

Obviously, after the war the demand for building will be great, and the hopeful believe that what has been and may be lost on the swings of destruction will be gained on the roundabouts of reconstruction. We must, in any event, work to provide comfortable homes on a majority basis. How comfortable these homes will be will depend on planning not locally but on a large scale. It is fantastic that there should be to-day something like 1,200 water authorities with particular and pettifogging regulations which retard home planning and the Gas Industry's efforts to provide hot water facilities economically. We use this as an example; a brush of the same colour would be appropriate to picture many of the activities of individual gas undertakings which still have a tendency to exhibit the strangest whimsicalities. Not that individuality is not necessary; it is indeed essential. But with an agreed policy and some measure of standardization better homes could be built and equipped economically for the majority of people; and it was towards this end that the Royal Society of Arts series of lectures was planned. As we have said, we think the series has been helpful.

From the remarks of several of the women who joined in the discussions, we gathered that for long centuries the rights of women in the kitchen and in the bath have been disgracefully neglected, and that the women of the future will no longer meekly submit to such treatment. They will demand controlled heat on tap or switch—automatically controlled heat for all domestic purposes. Well, both the Gas Industry and the electricity industry—at a price—could fulfil this demand. The extent of its fulfilment will depend on the pay envelope of the home occupier (whether the man or the woman produces the envelope is immaterial), and also on the way future housing is planned now. There is in our mind no doubt that, with good planning, the contents of the pay envelope spent on fuel in the home could be better apportioned. Homes in this country have not been built with a view to the conservation of heat and its application to hygiene and labour-saving. The heat comfort standard of the country is relatively low—*i.e.*, in relation to that of other countries, ally and enemy—and this in a country which has admirable fuel resources and an abundance of scientific ability. Architects have been content to design and pass plans with practically no regard for heating facilities. Houses by the million have been sold on "flimsies" such as tiled surrounds adorning fuel-consuming grates the last word in inefficiency; and these houses have been sold to women, who are now vociferous in their demands for controlled heat on tap or switch.

With planning, there is no doubt that a very great deal can be accomplished, and that in endeavouring to meet these

demands the Gas Industry has a most responsible part to play. The task is no light one, and it must obviously start by reorganization within the Industry itself. Discussion on ways and means to this end has been foremost in the Industry during the past twelve months and remains the vital topic; our pages week by week are sufficient indication of this, and it is certain that the younger members of the Industry have much to offer in new ideas which should not be stifled by arguments having solely as their basis established practice. What we want is the best of yesterday augmented by modern invention and a more spacious conception of the problem as a whole. Time is needed for clarifying views on all manner of questions, and time spent now—whatever the turn of events—is the reverse of wasted. Many of the demands may prove quite impracticable; on the other hand, standards of housing and heat comfort can be very greatly improved by planning in a big way (not, in the end, necessarily an extravagant way) and the application of patience and the exercise of an open mind. Certain cramping laws will have to disappear in this proper attempt to provide a better and more civilized home life for a bigger majority. To our mind it would be better—should this prove the only course—for there to be a time lag in rebuilding in order that planned schemes can be set on foot which will be of lasting and large-scale application rather than that a jerry-building rush be countenanced as a stop-gap.

As far as the Gas Industry is concerned (this applies, too, of course to other public utility undertakings) a major consideration affecting gas supply and its cost will be the future disposition of dwellings, whether they will be more concentrated or more scattered. Much discussion has centred and is being focused on this aspect. We learned last week of the results of a survey of the desires of a cross-section of everyday folk, and the vast majority of opinion, almost amounting to unanimity, favoured the house as distinct from the flat. To what extent is building to be scattered, with what this implies in the cost of providing heat and power? In the reorientation of industry will there be concentrated building on the flat system in the vicinity of industry, constituting towns built specifically as towns, and country property on contrasted lines designed in all respects as country property? Questions such as these intimately concern the Gas Industry on both manufacturing and distribution sides. Will, for example, the past practice of burying pipes and cables in the roadways and footways be superseded in our new industrial towns by some system of subways and culverts constructed to accommodate all pipelines? Do we require a new outlook on and a revised assessment of the relationships between capital costs and running costs of new schemes of distribution? For the solution of these and other questions co-operation between all concerned is imperative, and not least co-operation between the gas and electricity industries.

REFRIGERATION ON GAS-WORKS

GAS treatment by refrigeration at gas-works in this country has for one reason or another held out little appeal to the gas engineer. Indeed, as far as we are aware the only experiments on a works scale with the process have been confined to the Droylesden Works of the Manchester Corporation. Experiments were carried out there to test the possibilities of the absorption refrigeration machine when applied to the recovery of benzole from gas, and the results of these trials, given by Mr. A. Allen in a Paper to the Manchester and District Junior Gas Association, will be studied with interest. An abstract of the Paper will be found on p. 369 of our issue to-day, which includes a brief description of the plant used—a Dempster-Maiuri unit. Several claims were put forward for its operation, among these being dehydration, naphthalene extraction, and reduction in sulphur compounds, in addition, of course, to benzole recovery. The Author was quite frank in referring to the results as "more or less negative"; nevertheless the experience gained and the record of these negative results should be useful for future guidance. Refrigeration of coal gas may open up possibilities of benefit to the Gas Industry.

"New World" Patent Extension

Not long ago we referred to the position of holders of patent rights who, by reason of the war situation, are prevented from benefit of use both at home and overseas. Remembering our interest in the subject, Radiation Ltd. have just informed us that the period of validity of their present patent No. 261,609 has been extended for 2½ years, with leave to apply at the end of that time, and thereafter, for further extensions.

This patent is of prime interest to the firm, since it relates to the "New World" Regulo controlled cooker. Both by its merits and by skilled national advertising the name of this cooker has become established almost as a household word throughout the land, while the word "Regulo," greatly to the credit if not always to the commercial advantage of the firm, has been widely adopted as a patronymic for thermostatic cooker controls of all kinds. The whole Gas Industry therefore has a large stake in Patent No. 261,609, and will join with us in wishing Radiation well of it—particularly that the period of 2½ years, without "further extensions," will suffice to see their famous cooker playing the part it is undoubtedly destined to play in the post-war new world for which so many plans are already being discussed.

Future Street Lighting

In a recent lecture to the Illuminating Engineering Society Mr. G. H. Wilson said that a review of the decade ended in 1938 suggests that our technical resources are enormous and that technical problems are relatively easy of solution. It seems that the future of street lighting depends on the extent to which the scientific attitude of mind is employed in the application of the achievements of research. Perhaps something can be learned from another activity with which all the members of the community are concerned, that of town planning. Cannot the street lighting of the future be planned on a really bold scale? It will entail co-operation between local authorities and commercial undertakings, users and suppliers, scientists and salesmen all having but one urge, the supply and installation of the most effective lighting for the purpose in hand.

Personal

Mr. A. S. FOSTER, who has been with the Stourport Gas Company for 30 years, has resigned from the position of Manager to take up an appointment as Constructional Maintenance Engineer to the Severn Valley Gas Corporation, Ltd. Mr. E. H. GREENWAY, late of Chard, been appointed to the Stourport position.

* * *

On May 26 the employees of the Stourport Company gathered together at the Gas-Works to wish Mr. FOSTER every success in his new appointment, and to welcome their new Manager.

During the past thirty years Mr. Foster has increased the output of gas from Stourport Gas-Works to five times what it was when he first took up duties, and he has also invented numerous mechanical aids to gas production and distribution which are widely used throughout the Gas Industry.

In addition, for the past five years Mr. Foster has acted in an advisory capacity to the Severn Valley Gas Corporation and Gas Consolidation Constructional and Maintenance Engineering Department. Due to the growth of these organizations he has now had to relinquish the Managership of the Stourport Company to enable him to take up full time duty as Constructional and Maintenance Engineer on the Headquarters staff of the two Holding Companies.

Two years ago the first tar gas plant erected in Europe was put into commission at the Stourport Gas-Works.

Mr. Eric H. Greenaway, who succeeds Mr. Foster, was trained at Bodmin, where he served as Assistant Engineer and Manager. From 1931 to 1934 Mr. Greenaway was Engineer and Manager to the Helston Gas Department, and in 1934 he was appointed Engineer and Manager to the Chard Corporation Gas Department.

* * *

The Board of Directors of Newport (Mon.) Gas Company have elected Mr. R. WILSON BARTLETT, J.P., F.S.A.A., Deputy Chairman of the Company in the place of the late Mr. S. G. Wood. Mr. Bartlett joined the Board of the Newport Company in 1928, and the Board of the Severn Valley Gas Corporation in 1935. At a meeting of Gloucester Gas Light Company Mr. Bartlett was elected to the Board of that Company also in the place of the late Mr. S. G. Wood.

* * *

His many friends in the Gas Industry will be glad to learn that Mr. F. J. GOULD, of Bland Light, who underwent an operation on May 23, is making satisfactory progress and hopes soon to return to business.

His many friends in the Gas Industry will learn with relief and pleasure that Mr. H. E. STONE (Engineer and Manager of the Hong Kong and China Gas Company, Ltd., and of the Colombo Gas and Water Company, Ltd.) and Mrs. Stone were not in Hong Kong at the time of the Japanese occupation in December, 1941. Mr. Stone's present address is c/o Colombo Gas and Water Company, Ltd., Colombo, Ceylon.

* * *

In our issue of May 20 (p. 277) we announced incorrectly that Mr. W. C. CHAPMAN, of Boston, had been elected an Alderman by the Boston Town Council. Actually he has been elected a Councillor, and we apologize to him for an announcement which we trust is only premature.

Obituary

Mr. JOHN WILSON, Dundee Corporation Gas Engineer and Manager, died on May 24, at West Ferry. He had put up a brave fight against indifferent health during the past three years following a major operation.

He was 56 and was born in London, where his father was employed at Nine Elms Gas-Works. His family removed to Glasgow, and he was educated at Hillhead High School, Alan Glen's School, and the Royal Technical College.

After completing apprenticeship as a Gas Engineer he served with the Electricity Department of Glasgow Corporation. Later he went to Spain as Assistant Gas Manager and Electrical Engineer to the Huelva Gas and Electricity Company. In 1910 he returned to Scotland as Assistant Engineer and Manager of Falkirk Corporation Gas Department. He was appointed in 1915 to a similar position at Greenock, and two years later, on the amalgamation of Wishaw and Motherwell, he became Gas Engineer of the Burgh.

He went to Dundee in 1931. At the Dundee Gas-Works many of his own ideas were incorporated. A genial personality, he was a popular member of Dundee Rotary and Business Clubs.

* * *

The death occurred on May 16 of Mr. ROBERT A. HARVEY, Gas Manager, Catrine, Ayrshire. He was Gas Manager at Lockerbie for 22 years, being appointed to the Catrine post about 18 months ago.

* * *

The death has taken place of Mr. H. A. CROWTHER, of Malpas, at the age of 63. Mr. Crowther had been Manager of the Malpas Gas Company for 32 years.

Letters to the Editor

The West Yorkshire Gas Grid

DEAR SIR,—May I claim some of the valuable space of the "JOURNAL" for a few observations on certain salient points of Messrs. Hodkinson's and Taylor's outstanding Paper on Gas Distribution, which would seem to have important bearings on the development of future regional gas supply schemes.

The Authors demonstrate how the co-ordination of gas production and the extension of gas supplies to new areas and fresh consumers have achieved appreciable increases in gas consumption—in a typical case 60% in three years. Careful planning and bold courage have been at the back of the enterprise, which is reaping its reward. Both features will always figure prominently in all similar schemes of regional gas supply.

The result, however, has been achieved at the expense of distribution costs, but the increase is probably partly offset by reduced cost of production, full utilization of spare plant at gas-producing stations, and interconnexion of remote gas storage facilities. The latter, apart from ensuring continuity of gas supply, affect vitally the hourly distribution load factor, and obviously have been considered carefully in obtaining the 100% hourly load factor (1/24th of day's load) in the West Yorkshire Grid. Had the load factor of 30% or 40% been taken, which normally exists in distribution systems of gas undertakings, the scheme might never have materialized.

In this connexion it may be interesting to recall that according to the Departmental Committee on Area Gas Supply (1930), whom I had the honour to serve as consultant, the South Yorkshire Gas Grid would not have been a practical proposition, unless an hourly load factor of 100% and an annual load factor of 80% could have been visualized. This finding is a basic fact which will apply to practically all gas grids. Gas storage distributed over the area of supply will materially assist in obtaining this high hourly load factor, while the predominant use of gas for industrial purposes, which can be anticipated, will serve to maintain the annual load factor above the 65%, normally applying to the average gas undertaking.

The Authors compare the distribution costs of the West Yorkshire Grid with those given in the report of the Area Gas Supply Committee. The two, however, are not directly comparable, as they apply to different conditions. According to the evidence given by the Sheffield Gas Company before the Departmental Committee on Gas Supplies in the West of Scotland (1936), which, by kind permission of Sir David Milne-Watson, I was privileged to advise, "The costs, &c., of the Sheffield Gas Grid Scheme had worked out within the figures given by that (Area Gas Supply) Committee."

Although the basic data contained in the 1930 report were used in computing the costs of a grid scheme for the West of Scotland, the final costs were very different from those calculated for the South Yorkshire Grid, as the main items affecting costs—viz., volume of gas handled, distance of transmission, and load factors—were not the same in the two cases. It is therefore essential to work out costs for each individual case and its conditions, and no generalization is possible.

As the the cost of mainlaying, the figures given in the Paper will form a valuable basis for future grids. They are lower than those quoted by Mr. S. Lacey and those contained in the 1930 report, probably on account of the fact that the two latter sets of figures apply to made-up road, whereas a large part of the West Yorkshire Grid was laid in rural areas and in fields or on railway embankments. The savings effected would be offset by payment of wayleaves, but the expenses thus incurred, may be, and indeed probably would be, justified by a reduction of the overall cost of a grid. It would also seem that the use of spun C.I. mains would have tended to reduce costs, of both material and labour. The Area Gas Supply Committee was not disposed to recommend cast-iron mains for high-pressure distribution in a mining area and for pressures anticipated to exceed the 22 lb. per sq.in—given in the report as the maximum compression pressure—when the grid grew. Since they have been successfully employed in distribution systems, no hesitation need be felt for medium pressures such as are encountered in the West Yorkshire Grid. Steel, however, still has its use and is competitive, if not cheaper, in certain cases, but depreciation should be higher (20 years for steel) than for cast iron (30 years).

The high cost of steam, amounting to 70% of the total cost of compression, leads to interesting observations on alternative forms of energy (gas) and the economy derived from more efficient power units, points which, no doubt, will be duly observed in any future scheme, but the cost of power and hence the cost of compression depend much on the operating pressure and in turn on the size of the mains used.

Compression costs can be kept low by using relatively large mains and low pressures, which, broadly speaking, should be used for short distances and/or large volumes of gas. The correct choice of compression pressure and main size is, of course, of vital importance in order to obtain the minimum distribution costs. In this connexion Appendix 6 in the 1930 report, referred to before, may be of interest.

Finally may I lay emphasis on the advantages derived from the compression of gas for purifying processes. Use is made of it by the West Yorkshire Gas Distribution Company for the extraction of benzole, the removal of organic sulphur compounds, and the dehydration of the gas. There is no reason why the principle should not be extended to other parts of the purifying system. Apart from the benefit derived by the processes as such, the plant becomes much smaller and sometimes cheaper. In any case the very fact that its size admits of housing within reasonable space is in itself an attraction. There is no reason, too, why gas pressures should be confined to 30 lb. per sq.in., as the power required to compress gas to 330 lb. per sq.in. (6¼ h.p. per 1,000 cu.ft.) is only three times as high as that entailed by 30 lb. (2½ h.p. per 1,000 cu.ft.), but 37% (in actual practice 20/25%) of the total energy expended can be recovered in an expansion engine with the simultaneous reduction in temperature of the expanding gas. The cooling effect thus produced can be turned to good account for purification processes, which in consequence would assume forms totally different from those in vogue to-day.

The suggestion is by no means beyond practical possibilities or costs; on the contrary it bears in it all the elements of success, and appears to the undersigned one of the ways and means of turning the carbonizing industry into a "highly skilled chemical industry" visualized by the Authors.

Yours faithfully,

G. W. ANDERSON.

6, Beckton Gardens,
Beckton, East Ham, E. 6.
May 15, 1942.

Lost Therms

DEAR SIR,—Several years ago I issued a pamphlet dealing with "Lost Therms." I gave a table showing leakage, in therms per annum, of gas under various pressures, through holes in thin plates. A calorific value of 500 was assumed. Here is the table :

Pressures in inches of water.	¼ in. Dia.	½ in. Dia.	¾ in. Dia.	⅞ in. Dia.	1 in. Dia.	1½ in. Dia.
2	1,161	4,645	18,582	41,810	74,331	167,242
4	1,642	6,570	26,280	59,130	105,120	236,520
6	2,012	8,046	32,186	72,420	128,740	289,680
9	2,464	9,854	39,420	88,700	157,680	354,780
12	2,848	11,994	45,580	102,540	182,280	410,140

Rather startling figures ! If the percentage of "unaccounted-for" gas could be cut by half, it would be a wonderful contribution by the Gas Industry to our national war effort.

Yours faithfully,

May 18, 1942. H. H. H.

A Meeting of the General Committee of the National Federation of Gas Coke Associations will be held at Gas Industry House on Tuesday, June 9, at 10 a.m.

1942 "Journal" Directory

Page 18. CLEVEDON AND YATTON. E. V. Dunn (Minehead), *E. & G.M., vice* J. Harger Pye, retiring shortly.
„ 46. MINEHEAD. S. B. Jones (Clevedon and Yatton). *E. & M., vice* E. V. Dunn.
„ 50. NEW MILLS. W. Haworth (East Dereham), *E.*

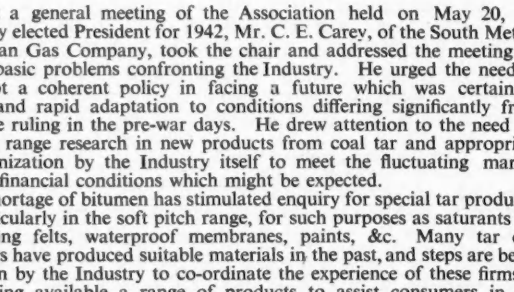
Society of British Gas Industries

The Society has appointed Mr. T. F. C. Potterton its Hon. Secretary in succession to Dr. E. W. Smith.

Association of Tar Distillers

At a general meeting of the Association held on May 20, the newly elected President for 1942, Mr. C. E. Carey, of the South Metropolitan Gas Company, took the chair and addressed the meeting on the basic problems confronting the Industry. He urged the need to adopt a coherent policy in facing a future which was certain to demand rapid adaptation to conditions differing significantly from those ruling in the pre-war days. He drew attention to the need for long range research in new products from coal tar and appropriate organization by the Industry itself to meet the fluctuating market and financial conditions which might be expected.

Shortage of bitumen has stimulated enquiry for special tar products, particularly in the soft pitch range, for such purposes as saturants for roofing felts, waterproof membranes, paints, &c. Many tar distillers have produced suitable materials in the past, and steps are being taken by the Industry to co-ordinate the experience of these firms in making available a range of products to assist consumers in the present shortage of bitumen for such purposes. The Association is already co-operating with other interests, under the aegis of the B.S.I., in work on a specification for coal tar pitch for roofing felts.



The illustration shows a part of the kitchen equipment at Providence Road Infants' School, one of the many cooking centres which have been organized by the Middlesex County Council for the feeding of London's school children. Radiation gas apparatus installed includes: 3-*oven "Guesthouse" range, pudding steamer, "Lune" boiler, &c., and is able to cater for* 250 *children.*

At the Annual Meeting of Ayr Gas Company, Ltd., it was stated that the revenue for the year, after providing for necessary expenses, including repairs, maintenance, and renewals, allowed of a dividend of 6½% less tax, being the same as for the previous year, and of the carry forward being slightly increased.

The British Standards Institution has just issued a British Standard Test Code for Coke Ovens, B.S. No. 999. This code forms one of the series of codes which are being prepared. It applies to by-product coke ovens and contains all the necessary data for the determination of the performance of the plant and the yields and qualities of the saleable products, together with a full explanation of how the necessary observations should be made. Purely scientific data not considered of importance to the operation of the plant are omitted. The standard provides for general information and description of the plant, plant performance, data relating to materials supplied, data relating to products, yields per ton of dry coal, carbonized fuel, gas consumption and carbon balance, and appendices deal with the method of sampling, method of measurement of temperature, and general notes regarding thermometers, &c. Copies of this new British Standard may be obtained from the British Standards Institution, 28, Victoria Street, S.W. 1, price 3s. 9d. post free.

Sampling and Testing of Coal and Coke

Since 1930 the British Standards Institution has published methods for the sampling and analysis of coal and coke to suit a variety of industrial requirements. During the preparation of these specifications experimental work has been carried out continuously by the members of the Committees, both upon the principles of sampling and upon the methods of analysis of the laboratory sample. A position has now been reached where, in view of war conditions, it is desirable to review all this work and to publish two comprehensive specifications embodying only the final terms arrived at, and excluding all preliminary standards superseded or altered as a result of the work of the Committees. The publication of these comprehensive specifications at this stage does not mean that the work of the Committees will cease, but since it was inevitable that the work would be slowed up owing to war conditions, it is more than ever important that the present stage should be made public.

One of these specifications covers the sampling of coal and coke down to the stage of the preparation of the laboratory sample; the other details the treatment of the laboratory samples and gives all the methods of analysis that have been approved after examination by the Committees.

In specification 1016, on the sampling of coal and coke, the weights of the gross samples specified are based on the size of the coal, on its variability, and on the degree of accuracy required of the analysis. The number and size of the increments required are chiefly determined by the variability of the coal, as indicated by the average deviation of the ash content from the mean. Since this deviation increases with increasing ash content, the coals are grouped for sampling purposes according to the amount of ash they contain.

This specification contains the approved methods of sampling under different conditions and of the reduction of the gross sample to the laboratory sample.

The basis of the method detailed for the sampling of coke is the same as that given for small coal in British Specification No. 403, the moisture content being taken as the determining sampling factor instead of ash, as being the more variable. In the application of this factor two classes of coke are recognized, and the size of the samples necessary for the desired accuracy are detailed in terms of varying moisture content in each class. These classes are as follows:

(1) Screened or unscreened coke containing not more than 7½% below 1 in. when quenched and not more than 5% moisture. This class therefore includes graded cokes.

(2) Other cokes and breeze.

The other specification (No. 1017) contains all the methods in common use for the analysis and testing of coal and coke. Emphasis is laid on the correct method of determining the moisture content of the gross sample.

The specification is divided into three parts. Part I deals with the analysis of coal, Part II with the analysis of coke (including physical tests), and Part III with the analysis of coal ash and coke ash. Under normal conditions British Standards Specifications are subject to periodic review in order to keep them abreast of progress in industry. Under the present abnormal conditions, however, it seems probable that these two specifications will remain unchanged for a longer period than usual.

Copies of the specifications may be obtained from the British Standards Institution, 28, Victoria Street, S.W. 1, price, No. 1016, 5s 6d. post free, and No. 1017, 3s. 10d. post free.

At the Annual Meeting of the Peterborough Gas Company it was resolved that the dividends be paid as follows: 5% per annum on the new Preference A Shares, and 7½% per annum on the Consolidated Ordinary Stock.

A Meeting of the Central Committee of the Federation of Gas Employers will be held in Committee Room 1, Gas Industry House, on June 9.

A Meeting of the Central Executive Board of the National Gas Council will be held in Committee Room No. 1, Gas Industry House, on Tuesday, June 9, at 2.30 p.m.

The Next Meeting of the Joint Research Committee will be held on June 26, at 2.30 p.m., Gas Industry House.

British Standard 219 for Soft Solders—Grades C/D/G/M/N—has been revised at the request of the Non-Ferrous Metal Control in order to effect economy in tin. The specification is accompanied by a memorandum which makes recommendations as to the manner in which economy in the use of solder may be effected. Copies of the specification may be obtained from the British Standards Institution, price 2s. each, 2s. 3d. post free.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

WALES ASSOCIATION AT NEWPORT

THE 37th Annual Meeting of the Wales and Monmouthshire Association of Gas Engineers and Managers was held on May 21 at Newport, Mr. J. F. Rust, the President, in the Chair. A civic welcome was extended by the Mayor of Newport, Mr. W. G. Rudd, who expressed appreciation of the work of gas undertakings in the prevailing difficult circumstances and said how glad he was that Newport's Gas Engineer should be their President.

The President spoke of the loss the Association had sustained by the death of Mr. Julian Stephenson, who had been a former President of the Association and a member since 1918.

The President then welcomed the guests present, saying how gratified they were to have with them Sir Frederick West, President of The Institution of Gas Engineers.

Election of new members was then announced: T. F. Edwards (Newport), D. A. Price (Brynmawr and Blaina), D. I. Rowlands (Caerphilly).

Moving the adoption of the annual report and statement of accounts (the latter, submitted by the Treasurer, Mr. J. H. Canning, showing a balance of £157 compared with £98), the President explained that the Council had given consideration to the inauguration of a memorial to the late Mr. H. D. Madden. Inauguration of a fund to be subscribed for by individual members was agreed upon on the proposition of Mr. W. C. Jackson (Neath), seconded by Mr. J. H. Canning. It was also agreed that the form the memorial should take would be a President's chain of office attached to which would be an inscribed medallion.

Mention was made in the report of the decision taken on October 23, 1941, to form a Joint Committee representing the Association, the N.G.C. District Executive Board, and South Wales District Members of the B.C.G.A. (four representatives from each of the three bodies).

Approval was given of the Council's recommendation of the following representatives on the Joint Post-War Planning Committee: Messrs. J. F. Rust, F. Boardman, R. L. Aspinall, and E. M. Edwards.

It was resolved that the Junior Gas Association of the District be invited to nominate two representatives to attend Council meetings of the Senior Association.

Referring to the Octavius Thomas Memorial Fund, Mr. J. H. Canning explained that the subscriptions reached £470, which had been invested in 2½% Consols. The chief interests of their late colleague lay in the young and in the old, and it had been thought that there could be no more fitting way of giving effect to the Memorial than by employing part of the sum subscribed to the provision of a prize for the most deserving student (and by "deserving" he did not mean necessarily the most brilliant) of the year, the remainder being handed over as a Trustee Fund to the Benevolent Fund of The Institution of Gas Engineers. The proposed allocation was two-thirds to the Benevolent Fund and one-third to the provision of a student's prize.

This was agreed to on the proposition of Mr. D. W. Davies (Tredegar), seconded by Mr. R. J. Auckland (Cardiff).

Election of Officers (to assume office from September next) followed:

President.—E. A. Pask.
Senior Vice-President.—D. Muir.
Junior Vice-President.—W. T. Kenshole.
Council.—F. Boardman, D. W. Rees, M.B.E., J. Powdrill.
Treasurer.—J. H. Canning, O.B.E., J.P.
Secretary.—E. M. Edwards.
Auditors.—J. H. Jones, K. E. Tiddy.

There was full agreement with the proposal that an Assistant Secretary should be appointed, and also with the proposition, put forward by the President, that the Association's subscription to the Benevolent Fund of The Institution of Gas Engineers should be increased from 10 to 15 guineas. In putting the motion, the President asked individual members of the Association to consider very seriously their own subscriptions to the Fund and to give it their utmost support.

Mr. Rust then gave his Presidential Address (see later), for which he was cordially thanked on the proposition of Mr. E. A. Pask, seconded by Mr. W. T. Kenshole.

Adjournment was made for luncheon at the King's Head Hotel, at which Mr. Rust presided. The toast of the Town and Trade of Newport was proposed by Mr. G. M. Gill, Managing Director of the Severn Valley Gas Corporation, Ltd., and Director of the Newport Gas Company, and the Mayor, Mr. W. G. Rudd, responded.

Sir Frederick West, C.B.E., in proposing the toast of the Wales and Monmouthshire Association of Gas Engineers and Managers, said how anxious the Institution Council was to achieve closer co-operation between the Parent Body and the District Associations. To help towards this it had been decided that after each Council meeting a précis of what took place should be sent to the District Associations for consideration and discussion. He also took the opportunity of urging members of the Wales Association to support to the full the Benevolent Fund of the Institution.

Mr. Rust, who responded, said how honoured the Association was that Sir Frederick had paid two visits to Wales meetings during his year of office.

The afternoon session was occupied by discussion of four of the Symposium Papers presented to The Institution of Gas Engineers in June, 1941—*viz.*, The Standardization of Coke Grades and Properties (W. L. Boon), Post-War Developments of Industrial Gas (H. R. Hems), Co-Ordination of the Carbonizing Industries (G. E. Foxwell) and Academic and Technical Education in the Post-War Gas Industry (John Terrace). A report of the discussion appears on pp. 364 and 365.

Presidential Address*

by

J. F. RUST,
Newport

WHILE our primary object must be the immediate task before us, maximum effort for victory, it is imperative that even in these busy and difficult days we should as opportunity affords commence to formulate a clear-cut and comprehensive policy for the future. In my opinion the Gas Industry will have a most important part to play in the reconstruction of this country. Never were the Government, the public, or industry more gas minded than they are to-day, and we must see to it that this gas consciousness is not lost in times of peace. It cannot be just a coincidence that during the 1914–18 War, and to an even greater extent during the present conflict, the Gas Industry has been strained to its limits to meet the demands of our factories and the needs of the general public. It is logical therefore to say that if gas has been proved to possess so many virtues as to make it indispensable to our industrialists in the manufacture of engines of war, it should be equally as indispensable in the manufacture of the commerce of peace. Only the very best is considered good enough in time of war, and I am persuaded that the same high standard of production and efficiency will be required if we as a nation are to compete successfully in the trade of the world in more tranquil times. Again, when we consider the domestic field, the future for gas is equally bright. Up to the present we have scarcely scratched the surface of the potential domestic load. I refer particularly to the possibilities of water heating, central heating, space heating, and refrigeration.

We have all heard about the various schemes which are receiving consideration from the powers that be for the future planning and rebuilding of England, the dispersal of industry, and the building of new towns and cities limited in population and sited in areas which would enable the population to live under ideal conditions, with open spaces, clean air, and maximum sunshine. If these things are to be (and they can and ought to be), gas must play an ever-increasing part in the improved life of the community. How are we as an Industry going to prepare to play this important part and to ensure that all the demands made upon us can be efficiently and adequately met? If the dispersal of industry and population is carried out as outlined, it is a certainty that a number of the new locations will be in areas at present supplied by comparatively small gas undertakings. To my mind, the first essential is to put ourselves in a position to be able to supply a standard quality gas in any quantity required, in any district, at the lowest possible economic price. We should be able to offer special contracts to industry, with attractive block and two-part tariff rates to domestic consumers. To do this satisfactorily the linking up of undertakings and the setting-up of area grids will become a necessity. The gas of the future, to satisfy the requirements of our industrial and domestic consumers, will undoubtedly have to be manufactured in large plant units, such as coke ovens and super gas-works, from which the medium and smaller undertakings will in turn draw their supplies. I do not for a moment suggest that smaller undertakings should lose their identities, as I feel that the local contacts made and the goodwill built up by the local management are assets much too valuable to be lightly thrown aside.

The value of such linking up or grids to the smaller undertakings can be readily seen. For example, the executive officer of one of these medium or small undertakings may be informed that a considerable development is proposed is his area and is asked whether gas is available in large quantities. Under normal conditions if his works were linked up he would be able to give an immediate answer instead of having to consider ways and means of redesigning and extending his comparatively small works, and in addition he would be able to concentrate all his energies in an endeavour to see that gas was going to be used for all possible purposes in the new development. I have in mind two small undertakings, working separately for many years to the capacity of their plants and supplying 26 million cu.ft. and 14 million cu.ft. respectively. A few years ago

* Abstract.

these companies were linked up to a larger undertaking by means of a high-pressure main taking a coke oven supply. As a result of this linking-up and the opportunity so afforded of taking advantage of developments within their areas the outputs of these two companies have now risen to 45 million cu.ft. and 52 million cu.ft. respectively.

From the national point of view also the gasification of coal in large plant units is bound to be of considerable benefit, for quite apart from the better standard quality gas produced, a more thorough extraction of the valuable by-products can be obtained.

During recent years this question of linking-up, or grids, has had much discussion and publicity, but there are still some in the Industry who look upon such a scheme as "visionary." The idea, however, is not so modern as may be imagined, especially as far as Newport is concerned. An old book entitled *The History of the Iron, Steel, Tinplate, and other Trades of Wales* records some of the activities of one of the most remarkable and versatile men of Monmouthshire—Samuel Baldwin Rogers, Metallurgical Chemist, Nantyglo. He realized, as early as 1815, the great proportions to which the railway system of England would expand, and had his ideas been practically adopted, the earlier and more methodic development of the mineral districts would unquestionably have been brought about. Among his proposals was a scheme that astounded everybody. This was put forth in a "letter" which he had printed and circulated at Newport. Rogers' notion was suggested by the distillation of coal in his laboratory. He had several years before submitted the idea to Humphrey Davey, who was delighted with it, to Benjamin Hall, of Llanover, and many others, who cordially supported him; but like most inventors, Rogers carried the matter up to a certain point, until 1841, when it was dropped. Briefly the idea was as follows: To establish at Newport and Cardiff branches for generating carburetted hydrogen and oil-plant gases from coal, coal tar water, or other proper organic or inorganic material, but principally from coal, and conveying the gases so produced through pipes of suitable dimensions and in various ramifications, to supply by measure the demand for light all along the route, and in the Metropolis! There are, he exclaims, no less than 800 tons of coal per day left as refuse at the collieries. The whole of this would suit for producing gas. Then the coke would come in for sale—1,200 tons a day or more, useful for the ports. He anticipated the production of by-products in the form of tar, ammonia, prussian blue, and sugar—afterwards discovered—and finally wound up with the benefits of ammoniacal water to vegetation, adding tables of financial results.

There is one further point which I should like to touch upon very briefly, and that is recruitment into the Industry of the right type of personnel. The Institution of Gas Engineers has rightly set a very high standard in its Examinations, and to pass these Examinations satisfactorily the student must have a high degree of education. In the post-war period the competition we shall have to meet will undoubtedly be very keen, and it is essential therefore that our Industry should attract young men with qualifications at least equal to those of its competitors. I am convinced that the right type can and will be available provided always that their remuneration is in no way inferior to that offered by other branches of industry.

I have the utmost confidence in the future of the Gas Industry. I am certain that if, building from our great experience in the Industry's long service to the public, we now adopt a modern outlook, a very prosperous future lies ahead. In this connexion I would plead for the inclusion of more of the young men in the higher Councils of the Industry. The good work being done by Junior Gas Associations should receive every encouragement, and representation on any Committee dealing with post-war reconstruction should be open to them.

DISCUSSION ON INSTITUTION SYMPOSIUM PAPERS 1941

ON May 21 the Wales and Monmouthshire Association of Gas Engineers and Managers, meeting at Newport, discussed four of the 1941 Institution Symposium Papers: The Standardization of Coke Grades and Properties (W. L. Boon), Post-War Developments of Industrial Gas (H. R. Hems), Co-Ordination of the Carbonizing Industries (G. E. Foxwell), and Academic and Technical Education in the Post-War Gas Industry (John Terrace).

COKE GRADES AND PROPERTIES

Mr. **Frank Boardman** (Cardiff) said that in South Wales little attention had been paid to the preparation of coke for the inland market. Were they satisfied that the coke produced in this area was a clean and marketable fuel? Would they be content to let old methods continue? Competition was bound to be greater after the war. Quality improvement depending on choice of coal could not be entertained under existing conditions, and it was rather out of the question, in view of the difficulty in obtaining new plant, to deal with standardization of sizes. They were matters of post-war planning. His Company started effective coke grading in 1928, and improvement in sales justified the venture. The sizes adopted approximated closely those advocated as standard by the London and Counties Coke Association. In the post-war market the quality of coke would assume greater importance.

The quality of coal, continued Mr. Boardman, had the greatest influence on the quality of coke. They must start with a raw material which would produce a readily saleable coke. During the past two years they had been receiving coal which was not suitable for gas-works purposes. Would coal suppliers get used to this state of affairs? It was amazing that the indictment could be made against the coal industry that in times when the nation's needs had called for the greatest efficiency in every direction the production of coal had deteriorated both in quality and in quantity. He suggested that in post-war years they should purchase coals on a thermal basis or guaranteed analysis within margins; for fuel sent below standard they should be compensated in tonnage. No move to effect this change would be made by the coal suppliers; it was up to the Gas Industry to introduce conditions, and they might well make arrangements for the inspection of coal at pit head. Area inspectors might be appointed for this purpose, the cost, which would be negligible on so large a tonnage, being levied by the Industry's national organizations.

Grading of coke could be done only by the installation of effective screening plant, and if they had standardization of sizes there could be uniformity in screening plant. As for marketing, in addition to contacting all users and potential users of coke, it was imperative that builders and architects should be persuaded to install appliances equally suitable for coal and coke. The aim should be to develop the local market to absorb coke and enable them to dispense with water gas.

Mr. **R. J. Auckland** (Cardiff) remarked that Mr. Boardman had appeared to suggest as a reason for neglect in Wales of the preparation of coke for marketing the competition it had to meet from other solid fuels; but surely the greater the competition the greater the need for careful preparation of the commodity they presumably were anxious to sell. The plea of the inferiority of Welsh gas coal was no adequate reason for neglecting ordinary commercial duty. They should take the same care and interest in developing coke markets as other industrial firms took in marketing their products. The purchase of washed coal might be a paying proposition, and gas undertakings would be well advised to purchase their coal year by year on test and not by name. The methods of selling coal since the Coal Schemes had been instituted were designed to break down this practice. Concluding, Mr. Auckland expressed pleasure at the progress made in the formation of the South Wales District Gas Coke Association.

Mr. **W. Clark Jackson** (Neath) said that coal as mined in South Wales contained, in bands, a large percentage of shale, and they could only produce a coke containing a reasonable ash content provided the coals were thoroughly washed. He had practised the production of coke from washed coals, and from washed coals domestic sales could be multiplied 300 or 400%. Survey had shown that there were coals in the area which, though they were not at present used in gas-works, would, with washing, give good results. He deprecated the over-dosing of coke with water; steam quenching was suitable for a coke destined for the domestic market. Overriding all, marketing of coke should be carried out by a central organization which could determine correct allocation of coke to various sections of the market.

Mr. **G. M. Gill** (Severn Valley Corporation) spoke of the importance of coal inspection at the pit head. The Severn Valley Corporation had practised this for several years and had enjoyed good results from this arrangement. The cost was low—it worked out at about ¾d. per ton of coal purchased—and the system was practical enough.

Mr. **W. T. Kenshole** (Merthyr Tydfil), referring to the sixth of the grades of coke recommended by Mr. Boon in his Paper (*i.e.*, unwashed fuel of approx. ¼ in. to ¾ in. from which the fines up to ⅛ in. have been removed), queried whether there was any appreciable demand for a fuel so small as that.

Mr. **Jackson** said he re-screened his breeze and sold "pea-nut" size fuel without any difficulty—the reverse, in fact—to fish-fryers who had no gas supply. The demand was there in South Wales in certain localities, and it pointed again to the need for regional marketing of coke.

Mr. **W. H. Johns** (Swansea) also emphasized the need for developing the coke market on a regional basis. Mr. Kenshole had spoken of his difficulty in marketing coke of a certain grade—a difficulty which did not exist in Mr. Jackson's area. If they had a regional scheme for marketing the various grades of coke, difficulties of a local nature would be automatically dissolved. The system of dry quenching of coke ought to receive careful consideration. With such a system coke containing 0.5% of water could be produced in horizontal retorts having properties similar to those of "Dryco." Coke ovens specified the coke they were prepared to supply. Why could not gas-works do the same? Regional selling of coke was a matter of important and urgent concern.

DEVELOPMENT OF INDUSTRIAL GAS

Mr. **E. M. Edwards** (Port Talbot, Secretary of the Association) suggested that two paragraphs in the Paper by Mr. Hems should guide to a large extent planning for the future of industrial gas. They were: "It has always appeared unsatisfactory that a nation which has natural fuel available should be purchasing from overseas before making the fullest use of its own resources, and at the same time having to pay for the enforced idleness of many workers engaged in its own fuel industry"; and "All fuels, whether home-produced or imported, should be applied in the most scientific, practical, and economic way to the various demands of the heavy and light industries of the country." Some undertakings, continued Mr. Edwards, showed large increases in load; others showed decreases. A balanced allocation of fuels was needed, and also needed was a standard basis of costing. They should know what in fact were the costs of manufacture to supply large-scale loads, and they must plan ahead, with the right personnel, for many years—planning with a view to the interests of the Gas Industry as a whole as distinct from the interests of any one gas undertaking. They would have to determine, in short, whether they were going to be a large-scale fuel industry or primarily a domestic load industry. The prospects would have to be assessed of the particular undertaking, the district, and the country, not merely as a wartime but as a peacetime measure. Unless an undertaking was well situated it could not cater with a load comprising, say, 20% domestic and 80% industrial; and to his mind utilization of coke oven gas was an essential feature of future development. The potential load was immense; as far as his own area was concerned gas could be applied in tinplate works to every purpose except steam-raising. In the future consideration might have to be given to supplying industrial gas, not on 100% guarantee, but on something rather less and more flexible; they must, however, have trained personnel, gas fuel engineers, to deal with the industrial gas business.

Mr. **F. J. Bell** (Cardiff), who expressed the opinion that the Industry was at the beginning of a new phase in industrial gas supply, spoke of the early work—as far back as 1910—on industrial load development at Birmingham, work which prospered because industrialists began to realize that they could count on sound advice on gas usage. The Industrial Gas Centres had come into being, rendering available a mass of most valuable information. Because of all this steady spade-work industrialists had learned the value of town gas and on all hands were demanding supplies. In face of such demand the Gas Industry had a great responsibility. The Industry was confronted with industrial business on a huge scale. At the same time sight should not be lost of the fact that the market for small industrial appliances was by no means fully explored.

Mr. **H. R. Hems,** Author of the Paper under discussion, suggested that a reasonable course of thought or action on the part of the Government of the country should be at least to tolerate and possibly expand the use of home-produced fuels until it was established that imported fuel, over and above this country's requirements which could be met by coal and its products, was vital to the nation's welfare. Study of industrial gas possibilities was absorbing. What an industrial gas engineer found himself doing was to assimilate the views of the user and become, as it were, detached from the view of the Gas Industry as a supplier of gas. He was convinced that industrial gas development would stride forward giant-fashion; and to come down to realities in his own area, the appreciation of industrial gas was simply overwhelming. So let them take vision of the future. There would be redistribution of industry; there would be dispersal of population; small undertakings would have to don a thinking cap if they desired to cope with the industrial load. Reorientation of at least some of the views held by some undertakings would have to take place.

Turning to fuel costs, what did they amount to in most industrial concerns? Industrialists, he thought, would inevitably come to the conclusion that they represented a slight, and only a slight, proportion of the total costs of manufacture of any product. Variations in fuel costs, variations of a minor order, were insignificant; industrialists would realize this truism.

CO-ORDINATION OF THE CARBONIZING INDUSTRIES

Mr. **G. M. Gill** (Severn Valley Gas Corporation) said that in the Severn Valley Gas Corporation and Gas Consolidation Group of about 50 gas companies they have taken gas in bulk from coke ovens in seven cases and considered that there had been an advantage to both parties from doing so. It would seem, he continued, that there should be the possibility of increasing the quantity of saleable coke oven gas if the means of heating the ovens could be made more flexible, whereby the gas used for heating the ovens could be made available for disposal to gas undertakings in the winter, by arranging that in the winter the coke ovens could be heated by producer gas, blue gas, or tar gas, mixed or not with coke oven gas, so permitting the supply of coke oven gas to gas undertakings to vary in quantity with the change in the seasons. An average gas undertaking would supply from 60% to 70% more gas on a cold winter day than on a normal mid-summer day, which, incidentally, was closely similar to the extra gas which could be supplied by a coke oven plant if some other heating gas were used for the ovens in the winter.

With certain designs of coke ovens producer gas could be used as a heating medium, the arrangement being such that coal gas or producer gas could be used as and when desired. By this means the quantity of coke oven gas could be varied to suit the demand of the user.

Gas made from tar had now been developed satisfactorily, and had been supplied to the district as a mixture with coal gas for the past two years at one of their gas-works. This type of gas was made in a specially designed plant and had a calorific value of about 400 B.Th.U. per cu.ft. It was similar to coal gas in all respects except in calorific value, while to make 1,000 cu.ft. of such gas it took 6 gallons of tar. Seeing that the demand for road tar was limited to the summer season, it should be convenient for a coke oven plant to use some portion of its production of tar for the making of gas in the winter to assist in heating the ovens, so making it possible to provide a larger quantity of gas in the winter to gas undertakings.

In some circles it was suggested that there might be some advantage in the Gas Industry abandoning the manufacture of coke in favour of some system of complete gasification. While some scheme of this kind might be developed in the somewhat distant future, he thought that it would be wrong to let their plans for the post-war period be delayed on the chance that the methods they employed to-day might not be the best for carrying on the Industry in the future. He thought that it would be much wiser to continue the manufacture of coke on a large scale by the Gas Industry. Mr. Gill stressed the importance of close co-operation by coke oven interests and the Gas Industry's Coke Associations, in order that the policy affecting sales of coke could be dealt with in each district by one body of people who would work in close touch with a Central Committee.

In his Paper, Dr. Foxwell had referred briefly to low-temperature carbonization, and from his comments it would seem that he considered it only as a sort of stop-gap whereby existing coal grates could be utilized efficiently and smokelessly. He considered that the production of low-temperature fuel would disappear in course of time in favour of the high-temperature carbonization of selected coals plus activation. If Dr. Foxwell's views were realized in practice, then it would seem that gas-works and coke oven plants too would be likely to play an important part in the future, in the provision of special smokeless fuels for the open grate. He would, however, mention the experiences of works in his Group in making free-burning coke by high-temperature carbonization. At three gas-works in the South Staffs area, some 25,000 tons of fairly high volatile, non-coking slacks had been used during the past six or seven years. This coal had been blended with high-class gas coal of bean size and of good coking properties from North Staffordshire coalfields, and carbonized at normal gas-works temperatures. At two works proper coal-blending plants were installed to do this work, but in the third works the blending had been satisfactorily carried out shovel by shovel throughout. At one works the final result was not satisfactory. At two works it has been continued throughout for many years, and there has not been any difficulty in producing an excellent coke from a blend of 50/50 strongly coking gas beans and non-coking slack. The results of the coke in the open firegrate were as good as those of low-temperature cokes. He was convinced that they had it in their own hands to manufacture a free-burning coke for satisfactory use as a smokeless fuel in ordinary household grates. There was, however, one all-important proviso respecting the possibility or otherwise of making such fuel. While there was an ample supply in the various coalfields of suitable coking and non-coking coal for use in making combustible fuel for the open grate, the carbonizer, owing to the application of the provisions of the Coal Mines Act, 1930, had no longer the freedom to select coals, and therefore any such developments were rendered impossible. It was imperative that users of coal should be given back their freedom to select their own raw material.

Dr. **G. E. Foxwell,** in a written communication, remarked that if the coke oven industry was to collaborate with the Gas Industry coke oven owners and colliery owners must come to regard themselves as part of a public service. It was necessary to conserve coal and to make use of inferior coals if means could be found for doing this economically. Coke oven gas must be utilized to the best advantage, and not used, as now, for heating the ovens, for boiler firing, &c. If properly organized, the bulk of the gas required by the Gas Industry, except in districts so remote from the coalfields that gas transmission would become impossibly expensive, could be secured from the coke ovens. To bring this about, plans must be made now. If there was some guarantee that the gas could be utilized the coke ovens could be rebuilt on the combination principle and heated by producer gas. By using producer gas for all purposes for which coke oven gas was now used at coke ovens and collieries, the quantity of coke oven gas available to the Gas Industry could be doubled. He believed that the coke ovens could supply from coking slack all the gas needed for the North, Midlands, and West industrial areas. There was no reason why coke oven gas should not be supplied very much more cheaply than town gas could be made at present, if based on pit-head carbonization of the cheaper grades of coal. He suggested that coke ovens (except perhaps those at steel works) should be immediately placed under the Gas Department of the Board of Trade, instead of under the Mines Department.

PROPOSED SCHEME OF GROUPING

In connexion with his Presidential Address to the Eastern Counties Association (see last week's "JOURNAL") Mr. F. H. Robinson exhibited two maps, one showing holding company organization "as it is in 1942," and the other "regional organization as it might be." Space limitations prevent our reproducing both maps, but as chief interest naturally centres round future developments along lines of grouping in districts where there are common trade interests, with district administration and the preservation of local contacts, the second map is given here.

RECOVERY OF BENZOLE BY REFRIGERATION*

By

A. ALLEN (Manchester)

THE object of this Paper is to describe some experiments that were carried out at the Droylsden Works of the Manchester Corporation Gas Department to recover benzole from town gas by refrigeration. The "Dempster-Maiuri" experimental plant used was the property of Messrs. R. & J. Dempster, Ltd., Manchester, and it was worked under the direction of the late Dr. Guido Maiuri.

The experiments described were primarily carried out to test the possibilities of the latest type of absorption refrigeration machine when applied to the recovery of benzole from town gas and, as far as I am aware, they are the only experiments of such a nature to be made in this country.

The first experimental Maiuri absorption machine was built in 1933, and it embodied the reversible absorption machine patented by Altenkirch, in Germany, in 1913. Maiuri machines have displaced the compressor system for dry ice plants in this country. Of eight plants of German or American origin existing in England in 1939, six have been transformed into the Maiuri system.

Operating System

The general arrangement of the Maiuri machine is shown in fig. 1. Its operation will be clearly understood when the following characteristics of ammonia are kept in mind:

1. That at −24° C., under ordinary atmospheric pressure, and at 0° C. under a pressure of 7 atmospheres, dry ammonia gas condenses to the liquid form.
2. That water at 0°C. dissolves 1,050 times its volume of the gas, and at 15°C. 727 volumes.
3. That the gas may be entirely expelled from the aqueous solution by boiling.
4. That the aqueous solution is lighter than water.
5. That if ammonia gas be generated in quantity and the receiver into which it passes be a closed vessel much smaller than the volume of gas generated, it will be compressed and ultimately condensed by its own pressure to the liquid form.
6. That the liquid, under suitable conditions, rapidly transforms to the gaseous state with a considerable depression in temperature.

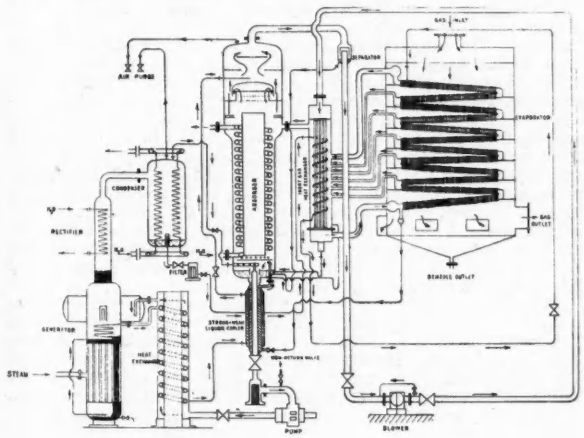


FIG. 1.

The machine employs aqueous ammonia as the working medium. In the generator ammonia is boiled out of a solution of ammonia in water by means of steam. The ammonia gas is freed from water in the rectifier and passes to the condenser, where it is liquefied. The rectifier and condenser are cooled by water. The liquid ammonia is pre-cooled in a heat exchanger and passes to the top of a series of gilled tubes enclosed in a steel tank known as the evaporator. Inert gas, either hydrogen or nitrogen, is caused to flow continuously through the evaporator tubes by means of a blower, the flow being from bottom to top—that is, in opposite direction to the flow of liquid ammonia. The liquid ammonia evaporated in the inert gas produces the required depression in temperature, and the gas now rich in ammonia passes through the heat exchanger to the absorber, where it is brought into contact with water. The water, that from which the ammonia has been expelled in the generator, is forced by the pressure existing in the generator through a heat exchanger and a strong and weak liquor cooler to a position near the top of the absorber.

* From a Paper to the Manchester and District Junior Gas Association, April 25.

The strong ammonia liquor produced in the absorber flows to the strong and weak liquor cooler, passes through a filter, and is pumped through a heat exchanger to the generator. The inert gas, more or less freed from ammonia vapour in the absorber, passes to an aqueous ammonia separator, through the inert gas heat exchanger, and returns to the evaporator.

The pressure in the evaporator tubes and the absorber is practically atmospheric, and very little pressure is thrown on the stuffing box of the blower. In the generator, the condenser, and the strong and weak liquor heat exchanger, the working pressures are considerable, and these vessels were tested to 30 atmospheres pressure.

Although the operation of the machine may seem to be somewhat complicated, in actual practice it works without the slightest trouble and does not require a very fine control.

The Gas Refrigeration Plant

The plant at Droylsden was designed to cool 500,000 cu.ft. of gas per 24 hours to a temperature of −45 to −50°C. It was installed to treat the purified gas. The gas was saturated with water vapour, and before it reached the evaporator it passed through two pre-coolers, where it was cooled by the debenzolized gas from the evaporator. Connexions and valves were arranged so that the flow of gas through the pre-coolers could be reversed and so prevent any blockage of pipes due to freezing of water.

The pre-coolers were of the vertical tube type. They were 18 ft. high by 3 ft. 6 in. diameter, made of ¼ in. steel plate and contained 180 solid drawn steel tubes 1¾ in. o/d. Each vessel weighed approximately 4 tons.

The evaporator was constructed of thin steel plates with suitable bracings. It measured 4 ft. 6 in. by 2 ft. 3 in. by 10 ft. 9 in. high, and contained 48 gilled tubes of 2 in. internal diameter. The gills were ⅜ in. apart and measured 5 in. square.

Suitable run-off pipes and separators were fitted to the pre-coolers and evaporators, as well as the necessary thermometers and pressure gauges. The evaporator, inert gas heat exchanger, and pre-coolers with their connexions were insulated with cork.

Dr. Maiuri estimated that with a coal gas throughput of 500,000 cu.ft. per 24 hours—that is 20,833 cu.ft. per hour—the steam consumption would be 160 lb. per hour, and the water for cooling purposes 720 gallons per hour when at a temperature of 65°F.

The gas to be cooled was produced in Glover-West vertical retorts and the gaseous yield per ton of coal carbonized averaged 88 therms. Taking the amount of recoverable benzole to be 3 gallons per ton of coal carbonized, it is found by calculation that to maintain the declared calorific value of 450 B.Th.U. at the outlet of the plant the calorific value of the gas to be debenzolized would have to be 472 B.Th.U., and the gaseous yield per ton of coal carbonized would be 18,644 cu.ft. If Dr. Maiuri's estimations are correct, 47·7 lb. of steam and 215 gallons of water are required per gallon of benzole produced.

It will be appreciated that the refrigeration of the Droylsden vertical retort gas will require a much larger amount of both steam and water than would be the case where lower gaseous yields obtain.

Claims put Forward for the Process

(*a*) That the process embodies: (1) Dehydration, (2) naphthalene extraction, (3) sulphur compounds reduction, (4) benzole recovery.

(*b*) That low pressure steam, such as exhaust from engines, at low cost is efficient. Other forms of waste heat might be utilized.

(*c*) That maintenance and operation costs should be low.

(*d*) That the various constituents of benzole may be separated by fractional condensation, or by taking advantage of their respective freezing points.

When the plant was first put to work difficulty was experienced in obtaining a sufficiently low gas temperature. After thorough investigation this was chiefly attributed to the fact that the pre-coolers with their connexions could not be satisfactorily cooled before passage of the gas through the apparatus. Including the evaporator itself, the weight of steelwork to be cooled to low temperature amounted to approximately 11 tons. To overcome the difficulty, a fan was fixed in a connexion between the inlet and outlet mains of the pre-coolers. This made it possible to circulate gas through the evaporator and pre-coolers until they were sufficiently cold to allow of uncooled gas being passed to the apparatus continuously.

The method of working was to fill the evaporator and pre-coolers with gas at the holder pressure of 8 in. W.G. The inlet and outlet valves of the plant were then closed, the fan started, and circulation continued until the gas pressure was reduced to about 2 in. W.G. by cooling. The pressure was then brought up to 8 in. W.G. by the admission of more gas. Circulation was recommenced and continued

until the temperature of the gas entering the evaporator was reduced to −20°C. After this procedure the plant was put into normal operation.

Typical working temperatures and pressures of the refrigeration machine are given in Table I.

TABLE I.

Generator. Temperature, °C. Bottom.	Generator. Temperature, °C. Centre.	Generator. Pressure, lb. sq.in.	Rectifier. Temp., °C.	Condenser. Temp., °C.	Absorber. Pressure, in w.g.
140	130	210	36	27	2

The plant had not been long at work when it was noticed that benzole was not flowing from the evaporator in the quantity expected. This was at first attributed to the freezing of benzole sufficient to cause blockage of the benzole outlet pipe at the bottom centre of the evaporator. A jacketted outlet pipe was fixed through which water at atmospheric temperature was circulated. This kept the benzole outlet pipe clear, but it did not materially increase the flow of product from the apparatus. Practically all the water contained in the gas was condensed in the pre-coolers, and as the calorific value of the treated gas was reduced as expected, it was assumed that a large proportion of the condensed hydrocarbon vapours were frozen on the tubes of the evaporator. Continued working proved that this assumption was correct, and after approximately 48 hours the plant had to be by-passed owing to the excessive pressure thrown by the practically blocked evaporator.

Dr. Maiuri had thought that the toluene, o-xylene, and m-xylene contained in the condensed mixture of hydrocarbons would have been sufficient to keep the whole in a fluid condition. This was not the case, and the spaces between the gills of the evaporator tubes became completely filled and increasingly covered with frozen benzole.

The evaporator was allowed to attain atmospheric temperature, and as the frozen mass thawed, samples were collected at various temperatures. The test showed that the difference in the specific gravity and distillation test of samples collected at −40°C. and at −50°C. was considerable.

That portion of the condensed hydrocarbons which did not freeze in the evaporator and, therefore, flowed away continuously tested as shown in Table II.

TABLE II.—Condensed Benzole as Continuously Passing from Evaporator.

Specific gravity at 15.5°C.	0.848
Distillation:	
Drop point, °C.	70
Up to 80°C., %	1.5
90°C.	11.0
100°C.	44.0
110°C.	88.5
120°C.	95.0
130°C.	97.0
Dry point, °C.	135

The first trial run proved that the condensed hydrocarbons could not be continuously removed from the evaporator owing to freezing taking place on the gills of the tubes. It also showed that condensed benzole vapour in the form of minute droplets was carried forward with the gas leaving the evaporator. Before the plant was again put to work, arrangements were made to try to overcome the difficulties mentioned.

In the hope of keeping the whole of the condensed hydrocarbons in such a state that they would flow away from the evaporator tubes, m-xylole was sprayed into the gas stream as it entered the top of the evaporator. A brush benzole mist extractor was fixed at the outlet of the exaporator.

The m-xylole used had a specific gravity of 0.862 at 15.5°C., it showed slight turbidity at 0°C., freezing proper commenced at −38°C., and it was completely frozen to a stiff pasty mess at −76°C. This m-xylole was sprayed into the gas stream at the rate of 12 gallons per hour, but it did not prevent freezing of the benzole in the evaporator.

The mist extractor was effective, and was the means of increasing the amount of recovered benzole by 0·42 gall. per ton of coal carbonized.

Another attempt was made to prevent benzole freezing in the evaporator, this time toluene being used instead of m-xylole. The toluene had a specific gravity of 0.869 at 15.5°C., it showed slight turbidity at 0°C., and the turbidity increased only slightly at a temperature of −76°C.

As in the case of m-xylole, the toluene was sprayed into the gas stream at the rate of 12 gallons per hour. This also wasun successful in preventing freezing of benzole in the evaporator.

It was now thought that the admission of toluene to the gas, through a spray nozzle, was not successful because streams of toluene might exist, instead of spray. After consideration, it was decided to add toluene to the gas stream in the form of vapour. This was done at the rate of 12 gallons per hour by evaporation in a small steam-heated vessel. The plant was put to work with perfectly clean evaporator tubes, but the toluene vapour did not prevent the troublesome freezing of benzole on the evaporator tubes. It appears, therefore, that the freezing is selective, and a new type of low temperature cooling vessel is required.

It will be realized that any steam or water consumption I might give would be of little value because the consumption of both gradually increased as frozen benzole accumulated on the evaporator tubes. So long as the evaporator tubes remained fairly free from frozen benzole, the sulphur compounds removal from the gas was approximately 50% of the original content, and the efficiency of benzole extraction was about 90%.

Regarding the removal of sulphur compounds, an experiment was carried out to determine the effect of passing debenzolized gas at the outlet of the evaporator over activated carbon. A small tube containing various amounts of activated carbon was fixed inside the gas outlet pipe of the evaporator, the gas passed through was metered, and the results are shown in Table III.

TABLE III.—Sulphur Compounds Removal from Gas.

Test No.	Total Sulphur Compounds in Gas. Grains per 100 cu.ft. At Inlet to Refrigeration Plant.	At Outlet of Refrigeration Plant.	After passing Activated Carbon.	Weight of Activated Carbon used.
1	36.2	20.3	10.8	5⅛ oz.
2	36.2	20.2	9.2	6¼ ,,
3	36.3	20.2	4.8	7¼ ,,

Conclusion

It is concluded that although the results of the experiments described in this Paper are more or less negative, further work should be carried out to find a method of reducing the temperature of the gas to −50°C., other than by the use of gilled steel tubes, and heavy steel pre-coolers. The experience gained and the value of recording negative results should be useful for future guidance.

I am of the opinion that if the refrigeration of coal gas receives the attention that it deserves, it may open out possibilities that will give untold benefit to both the nation and the Gas Industry.

Discussion

Mr. **H. G. Cooper** (Manchester) asked why a secondary process of cooling was adopted. Was it more efficient than compressing the coal gas itself and cooling by adiabatic expansion? About 1892 an English patent was taken out working on this cycle. The gas was compressed to 4 atmospheres, cooling to 12°C. and then by expansion to −80°C. According to the present Paper, the process required 47 lb. of steam and 215 gallons of water per gallon of benzole. An efficient oil-washing process required 30–40 lb. of steam and approximately one-tenth the quantity of water. In the case of activated carbon the steam consumption was even less. In these items the Maiuri process compared unfavourably with existing practice. With regard to the blocking of the gas ways and the use of particular solvents, the Author believed the freezing to be selective. It would appear, however, to be due to one or both of the following: (1) That at the lower temperatures eutectic freezing points were reached; (2) that traces of water vapour and mechanically carried water spray froze to a fine cell-like structure which occluded the spirit and formed what might be called an "emulsoid."

It might have been better to employ a paraffinic hydrocarbon as a solvent. On the other hand, was it a case of the chemist and physicist being too academic? Could not some simple scraping device have been incorporated in the design of the plant? It was surprising that the sulphur bodies in the gas were not removed completely. In the activated carbon process 70% of the sulphur compounds were removed. It was of interest to note that there was no such fraction as solvent naphtha in evidence.

Mr. **Allen** said that the reason for using the absorption refrigeration machine instead of cooling the gas by means of compression and expansion was stated in the Paper. He pointed out that the actual steam and water consumption per gallon of benzole was not given because the freezing of condensed hydrocarbons on the gills of the cooling tubes commenced at the outset, with the result that more steam was used than was actually required for benzole recovery. It was noticed that the steam consumption of the plant increased at the rate of 3 lb. per hour over the whole of a working period of anything up to 48 hours. This was undoubtedly due to freezing in the evaporator. He had good reason to believe that Dr. Maiuri's estimated steam consumption was substantially correct, and if Mr. Cooper would think of the process as a whole—that is, 90% benzole recovery and dehydration of gas—he would find that the steam consumption compared favourably with either the wash-oil or activated carbon process. Water could be taken from a closed circuit, and in many works the quantity used would not be of any great importance. Mr. Allen was of the opinion that eutectics had nothing to do with the freezing in the evaporator; the eutectic of benzene and toluene was at −99.8°C., and the working temperatures were not of this order at all. Likewise the suggestion that water vapour on spray might be the

cause of the trouble did not fit in with actual experience, because nothing but a trace of water was found in the products that thawed out of the evaporator. The suggestion of a scraper was nothing new, as this method had been tried out on the Continent. He could not agree that paraffins should be used as solvents. Why contaminate the products with such substances? It was not surprising that the sulphur bodies in the gas were not removed completely. One had only to consider the vapour pressure of carbon disulphide to realize that its removal could be complete at a temperature of −45°C.

Mr. **R. Walker** (Manchester) said that Mr. Holton was responsible, along with Messrs. R. & J. Dempster, Ltd., for erecting the plant. Although the experiments had been negative in their results, they had been a useful contribution towards ascertaining the best method of obtaining the hydrocarbons from the gas. It was unfortunate that the experimental work had come to an end so abruptly, for the process of refrigeration deserved the closest study of the Gas Industry. One of the reasons for spending time and money on the Maiuri process was an endeavour to solve that vital problem of the Gas Industry, the removal of sulphur compounds. It would appear that reliable results could be obtained with less trouble, and, in particular, the results were more satisfactory with the activated carbon process. By increasing the rate of oil circulation in the wash-oil process, sulphur compounds could be reduced, and also by using compressed gas.

Mr. **W. Hodkinson** (U.K.) said that in one of their undertakings they had been able to get down to 3½ grains of sulphur compounds per 100 cu.ft. of gas, but they had a major advantage in so far as the gas was compressed to 30 lb. per sq.in. He had looked at the question of refrigeration from rather a different angle, for he had in mind chilling the gas in the ammonia washer. He suggested an investigation into the possibility of scrubbing the gas with ammoniacal liquor, chilled to 4°C. In making any comparisons, he wished to call attention to the fact that in the wash-oil process the results were masked by entrained oil. A further advantage was that by pre-cooling the gas at the ammonia scrubbers there was greater ammonia concentration.

Mr. **F. Bell** (Liverpool) said that he had assisted in an investigation on a laboratory scale at Leeds on the question of refrigeration for dehydration, but one of the difficulties had been the naphthalene content of the gas.

Mr. **Allen** replied that there was very little naphthalene in the Droylsden gas, which was obtained from Glover-West retorts, and what there was came down with the benzole.

Mr. **J. Albinson** (Manchester) said the Paper showed that refrigeration might be done cheaply, and he congratulated Mr. Allen on publishing results of what was more or less a failure. If one wished to abstract or transfer heat, the Paper showed that it should be done by intimate contact with the gas, rather than by means of tubes. If glycol solution had been circulated through the cooling vessel, it might have brought down the solid parts as combustible hydrocarbons. There were possibilities with the refrigeration process.

Mr. **F. J. Siddall** (R. & J. Dempster, Ltd.) stated that the subject would have been very much to the front had Dr. Maiuri still been available. In his opinion, industry generally had been robbed of a great specialist on refrigeration methods. The plant at Droylsden was designed to recover 90% of the benzole from 500,000 cu.ft. per diem of vertical retort gas, with the following characteristics: 30–35 grains of sulphur per 100 cu.ft., initial temperature of gas 65°C. The plant was termed a "low diffusion unit" of 40,000 B.Th.U. per hour, and required a supply of steam at 60 lb. pressure and cooling water at 65°F. The pressure thrown by the apparatus was given as being 1 in. W.G., but this was proved to be lower when everything was free from deposit.

Mr. **H. C. Applebee** (Manchester) called attention to the fact that the entrainment of oil in the product vitiated to a large extent a direct comparison between the wash-oil process and the refrigeration process. He strongly deprecated the use of paraffins as a solvent. In the experiments the sulphur compounds were reduced by approximately 50%, but it had been hoped that the figure would have been reduced to 2 or 3 grains per 100 cu.ft. Xylole or toluene had been used as described in the Paper partly in an attempt to keep the products liquid and partly in the hope that the sulphur compounds might be dissolved out, so further reducing the sulphur compounds in the gas, but this hope was not realized. It should be borne in mind that the Maiuri plant not only recovered the benzole, but also dehydrated the gas and removed the naphthalene.

In comparing the costs, the overall cost of all the processes should be considered and not merely the cost of benzole extraction. A recent article in the "GAS JOURNAL" indicated that the costs were: For wash-oil recovery 2.47d. and for refrigeration 2.51d. per gallon of benzole recovered, the difference in cost being only 1½%.

Mr. **E. Bates** (Manchester) asked if two evaporators had been considered so that the frozen hydrocarbons could be thawing in one while the other was cooling the gas.

Mr. **Allen** replied that this had been considered, but it was felt that the additional cost of another evaporator would make the plant too expensive when compared with other processes. He also mentioned that it would be possible to thaw quickly the frozen hydrocarbons in the evaporator by an arrangement whereby warm water from the generator was circulated through the evaporator tubes.

ASSOCIATED GAS AND WATER UNDERTAKINGS, LTD.

The Ninth Ordinary General Meeting of Associated Gas and Water Undertakings, Ltd., was held on May 27, at 2, Chart Lane, Reigate, Surrey.

Mr. W. H. BENNETT, Chairman of the Company, said: The gross revenue for the year, amounting to £166,369, shows an increase of £9,002, but taxation has risen by over £12,000. After providing for this and for debenture interest and other expenses, the resultant net profit is £61,820, as compared with £63,758 for the previous year.

These satisfactory results enable your Directors to recommend the payment of a final dividend on the ordinary shares of 5% per annum, which maintains the rate paid since the inception of the Company. This will increase the sum to be carried forward by £8,888 to £50,050, representing two years' dividend on the ordinary capital at the present rate.

Investments in the balance sheet have increased by £73,816 to £3,035,351 (due to the acquisition during the year of a Gas and a Water Company) while £25,000 has been invested in new Government Loans, apart from £45,000 put into such issues by our Subsidiary Companies themselves. The additional shares issued in exchange for capital in the recently acquired Subsidiaries have brought the total issued share capital up to £2,349,856.

It is anticipated there will not be any liability in respect of excess profits tax and consequently the reservation against this contingency has not been increased. Sums have generally been set aside in the accounts of our Subsidiary Companies to meet liabilities which will arise when the Government's Scheme is formulated for dealing with contributions by public utility undertakings under the War Damage Act, 1941.

The acquisition during the year of the Portishead Gas Company, Ltd., and the Steyning and District Waterworks Company, Ltd., has added two Undertakings to our Group in areas where we are already interested. The Portishead Gas Company adjoins our Clevedon Gas Undertaking, while at Steyning we now control both the Gas and Water Utilities. Every advantage will be taken of the opportunities which are thus presented for securing increased efficiency and economy in the interests of the public and our shareholders.

Difficulties as to coal and personnel have constituted formidable problems in the manufacture and distribution of gas and its by-products. Gas undertakings are obliged by statute to maintain an uninterrupted supply of gas of constant quality. They now have to do so by carbonizing coal of continually varying quality and delivered irregularly. This does not lead to the most efficient and economic gas-making, and since the carbonization of coal is the most efficient way of utilizing the country's greatest asset, no steps should be spared to see that waste brought about in these ways is avoided.

It is inevitable in war that shortage of personnel should present grave difficulties. Despite extensive reservations, our companies have lost large numbers of men to the Forces, and it is somewhat discouraging to find that many of the women trained to take their place, in the office and on the district and works, are liable to be called up.

It has been possible to maintain our plant, mains and equipment to satisfactory working standards, and even to extend them where the national interest has so required.

In this matter, as in dealing with questions affecting personnel, much help has been forthcoming from the recently constituted Directorate of Gas Supply of the Board of Trade. Valuable guidance on general matters of policy has been given, and the Director-General and his Assistants are active in presenting the Gas Industry's case to the Government. The Directorate is expanding the work hitherto ably done by the Gas Administration Department of the Board of Trade.

I acknowledge with gratitude the assistance given by Local Directors, and pay tribute to the work of the officers and employees of the Company and our Associated Undertakings.

A meeting of the B.C.G.A. full Executive Committee will be held at Gas Industry House on June 11, at 11 a.m.

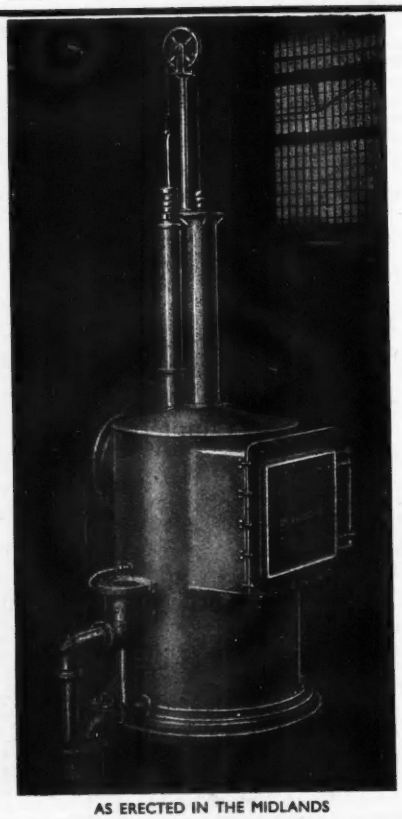
Dougall's Gas Meters, Ltd., have declared and paid a dividend of 7% on both their Preference and Ordinary Capital in respect of the year ended Dec. 31, 1941.

The Extraordinary Situation has arisen in Bangor (Co. Down) that gas consumers are to receive a refund of a portion of their gas bills. In July last the Borough Council imposed an additional charge of 7d. per 1,000 cu.ft. Since then they discovered that the Defence Gas Charges Orders under which the advance was made do not apply to Northern Ireland. They did not secure the necessary licence from the Board of Trade. The licence was obtained from the Board of Trade in March and regularized the increase of 7d. per 1,000 cu.ft. as from April 1. The licence, however, was not retrospective and the additional sum charged in the nine months preceding is to be refunded to consumers.

SAWER & PURVES
METERS
HAVE BEEN
GIVING
NATIONAL
SERVICE
SINCE 1869

NELSON METER WORKS
MANCHESTER 10
TELE COLlyhurst 2289
SAWER MANCHESTER

also at
NOTTINGHAM
Telephone : 75202
WATFORD
Telephone : 2645



AS ERECTED IN THE MIDLANDS

GAS WORKS PLANT
OF
ALL DESCRIPTIONS
INCLUDING
P. AND A.
TAR EXTRACTORS.

C. & W. WALKER, LTD.
DONNINGTON,
NR. WELLINGTON——SHROPSHIRE.
'Phone : Wellington-Shropshire 12. 'Grams : "Fortress," Donnington, Shropshire.
LONDON OFFICE — Temporary Address:
DONNINGTON, WELLINGTON, SHROPSHIRE

Gas Products Prices

The London Market June 1.

The only change in the prices of Coal Tar Products in the London Market refers to 95/160 Solvent Naphtha, which is now about 2s. 3d. to 2s. 7d. per gallon.

The Provinces June 1.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7½d. to 8d.

*In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland May 30.

All products in active demand. Refined tar controlled. Value about 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 6¾d.; low gravity, 7d. to 7½d.; neutral oil, 6½d. to 6¾d. per gallon; all *ex* Works in bulk. Cresylic acid is difficult to negotiate. Prices from 3s. 6d. to 5s. per gallon, *ex* Works naked. Crude naphtha: 6½d. to 7d. Solvent naphtha: 90/160 grade 2s. to 2s. 3d. and 90/190 Heavy Naphtha 1s. 9d. to 2s. per gallon. Pyridine: 90/160 grade 13s. and 90/140 grade 15s. per gallon.

TRADE CARDS

FULL particulars of these spaces can be obtained on application to the Publishers. They are designed principally for the use of the firms whose display advertisements cannot be included owing to paper rationing.

GILLS PRESSURE CASTINGS

215, Tyburn Road, Birmingham, 24. T/N EAST 1008

Casters in

"MAZAK" ZINC BASE ALLOYS

Arkon

INSTRUMENTS

Gas Flow Recorders and Indicators
Pressure and Vacuum Recorders and Indicators
Full Scale or Inclined Gauges

WALKER, CROSWELLER & CO. LTD.
CHELTENHAM, GLOS. Cheltenham 5172

A. G. SUTHERLAND LTD.

Warwick Road, Greet, Birmingham. T/N Victoria 2184-5. T/A Metriform, Birmingham. London: Riverside Road, S.W. 17. T/N Wimbledon 5454. T/A Insituslot, Toot, London, and at Salford and Nottingham.

GAS METERS

THE WHESSOE FOUNDRY AND ENGINEERING CO. LTD.

Darlington. T/N Darlington 2734. T/A Whessoe, Darlington, and Potten End, Berkhamsted. T/N Berkhamsted 330. T/A Whessoe, Berkhamsted.

Cylindrical, Spherical, Spiral and Column Guided Gasholders. Electro-Detarrers, Washers, Purifiers, Condensers.

YEOMANS AND PARTNERS LTD

London: 41, Upper Berkeley St., W1. PADD 9293
Specialists in difficult Building Works
Structural Camouflage—Gasholder Painting, &c.

MANUAL OF PRACTICAL GASFITTING

(In one volume)

by R. N. Le FEVRE

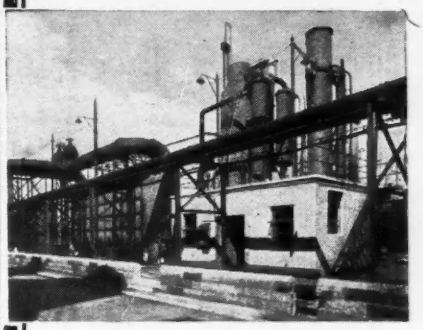
Price 7/6 plus 6d. postage
12 copies £4 post free

WALTER KING, LTD.

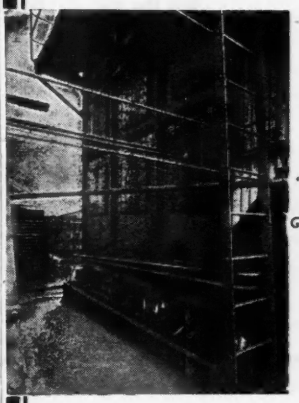
51 HIGH STREET, ESHER, SURREY

Esher 1142

Every Joint Sound!



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.

Ever since 1913 "PERMAC," the original Metal-to-Metal Jointing, has been holding up difficult joints like these in important Gas Works and on Coke Oven Plants all over the world. Equally suitable for any joint—steam, water, gas, oil — screw pipe or flange.

Send for particulars

Permac
METAL-TO-METAL JOINTING MATERIAL

Sole Manufacturers:

THOMAS & BISHOP LTD

(formerly of 37, Tabernacle Street, London, E.C.2)

Temporary address:
39, Arthur Road, Wimbledon Park, London, S.W.19

For every size of works and every class of coal...

WEST'S

CARBONIZING PLANTS

GLOVER-WEST VERTICALS

WESTVERTICAL CHAMBERS

440 carbonizing plants have been built or are under construction by West's in 24 countries. Working results from a wide variety of gas coals have established the high efficiency and adaptability of the West systems.

WEST'S

GAS IMPROVEMENT CO · LTD ·

MILES PLATTING MANCHESTER 10

TELEPHONE—COLLYHURST 2961-2-3-4-5 TELEGRAMS—STOKER, MANCHESTER

LONDON OFFICE TEMPORARY ADDRESS—BATH ROAD · HARMONDSWORTH · WEST DRAYTON · MIDDLESEX TEL.—WEST DRAYTON 2288-9

GAS STOCKS AND SHARES

As elsewhere, business in Gas Stocks and Shares was on a slightly smaller scale last week. Prices continued to harden, however, and it will be seen in the accompanying list that all movements were in an upward direction. After some weeks at the lower figure, Gas Light units jumped up 9d. to 13s. 6d. and Imperial Continental again hardened, closing 5 points higher at 59½. The heaviest increase occurred in the Supplementary List where Plymouth and Stonehouse 5% debenture gained 8 points to 105½.

It will have been noticed that for some time past prices in this section have been steadily rising. In April about forty Stocks were marked up and during May over thirty quotations appreciated, while losses have been negligible.

The following quotations were changed during the week:

SUPPLEMENTARY LIST

Cheltenham 4 p.c. Deb.	82—87	+2
Croydon 4 p.c. Deb.	85—90	+2
Plymouth & Stonehouse 5 p.c. Deb.	103—108	+8

OFFICIAL LIST

Associated Gas & Water Ord.	15/6—16/6	+-/3d
Brighton 5 p.c. Cons.	68—73	+3
Croydon 5 p.c. Deb.	109—114	+2
East Surrey 5 p.c. Deb.	107—112	+2
Gas Consolidated "B" Ord.	15/—17/-	+1/6d.
Gas Light Units	13/—14/-	+-/9d.
Imperial Continental Ord.	57—62	+5
Montevideo	75—80	+2
Severn Valley Ord.	17/—19/-	+-/6d.
South-Eastern Gas Corporation 4½ p.c. Pref.	16/—18/-	+-/6d.
South Metropolitan Ord.	50—55	+2
Ditto 3 p.c. Deb.	78—83	+1
South Suburban 5 p.c. Pref.	93—98	+1
Ditto 4 p.c. Pref.	75—80	+1
United Kingdom Gas Corporation Ord.	15/—17/-	+-/6d.
Ditto 3½ p.c. Red. Deb.	87—92	+2
Wandsworth 4 p.c. Pref.	74—79	+1

Quotations on the London and Provincial Stock Exchanges

OFFICIAL LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations May 28.
1,767,439	Mar. 9	5	5	Alliance & Dublin Ord.	93—98
374,000	Dec. 29	4	4	Do. 4 p.c. Deb.	95—100
957,608	May 11	5	5	Ascd. Gas & Water U'd'ts Ord.	15/6—16/6
500,000	,,	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/—17/-
535,545	,,	4	4	Do. 4 p.c. Red. Cum Pref.	15/—17/-
336,646	,,		4	Do. 4 p.c. Irred. Cum. Pref.	12/—14/-
561,370	Mar. 9	7	7	Barnet Ord. 7 p.c.	125—130
300,000	May 18	1/4⅜	1/9⅜	Bombay, Ltd.	17/6—19/6
690,407	Feb. 23	7	7	Bournemouth 7 p.c.max.	123—128
362,025	Dec. 15		4	Do. 4 p.c. Deb.	90—95
659,955	Mar. 2	2½	3⅜	Brighton, &c., 5 p.c. Con.	68—73
855,000	,, 16	6	6	Brit. Gas Light Ord.	72—77
545,000	Dec. 15	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	105—115
120,000	,,	4	4	Do. 4 p.c. Red. Deb.	75—80
10,000	Nov. 6 '33	6	4	Cape Town, Ltd., 4½ p.c. Cu. Pf.	¼—¾
626,860	Feb. 2	6	6	Cardiff Con. Ord.	100—105
24,500	Sept. 29	7	7	Colombo 7 p.c. Pref.	19/—21/-
764,169	Mar. 23	-/11.48	-/9.56	Colonial Gas Assn. Ltd. Ord.	⅜—⅝
400,000	,,	1/3.30	1/3.298	Do 8 p.c. Pref.	⅜—⅝
1,748,935	July 22 '40	2	3	Commercial Ord.	32—37
620,000	Dec. 8	3	3	Do. 3 p.c. Deb.	58—63
286,344	Feb. 16	5	5	Do. 5 p.c. Deb.	93—98
807,560	Feb. 23	6	6	Croydon sliding scale	95—100
644,590	,,	5	5	Do. max. div.	82—87
620,385	Dec. 29	5	5	Do. 5 p.c. Perp. Deb.	109—114
179,500	Feb. 9	5	5	East Surrey 'B,' 5 p.c.	70—75
176,461	Dec. 15	5	5	Do. 5 p.c. Deb. (Irred.)	107—112
250,000	Nov 10	6	4	Gas Consolidation Ord. 'B'	15/—17/-
250,000	May 11	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6
19,122,910	July 29 '40	3⅜	4½	Gas Light & Coke Ord.	13/—14/-a
2,600,000	,,	3½	3½	Do. 3½ p.c. max.	48—53
4,477,106	,,	4	4	Do. 4 p.c. Con. Pref.	62—67
2,993,000	July 8 '40	3⅜	3⅜	Do. 3½ p.c. Red. Pref.	71—76
8,602,497	Dec. 1	3	3	Do. 3 p.c. Con. Deb.	83—86
3,642,770	,,	5	5	Do. 5 p.c. Red. Deb.	105—109
2,500,000	,,	4½	4½	Do. 4½ p.c. Red. Deb.	103—107
700,000	Mar. 9	3½	3½	Do. 3½ Red. Deb.	88—93
5,600,000	May 13 '40	4	8	Imperial Continental Cap.	57—62
43,820	Jan. 26	3½	3½	Do. 3½ p.c. Red. Deb.	90—95
231,978	Feb. 23	5	5	M.S. Utility 'C' Cons.	73—78
918,657	,,	4	4	4 p.c. Cons. Pref.	77—82
675,000	May 4	†4	†4	Montevideo, Ltd.	75—80
300,000	April 27	9	7	Oriental, Ltd.	85—95
368,537	July 14	6½	3½	Plymouth & Stonehouse 5 p.c.	65—70
621,667	Feb. 9	7½	7½	Portsmouth & Gosport Cons.	87—92
648,999	May 26	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	17/—19/-*
597,972	Mar. 9	4½	4½	Do. 4½ p.c. Cum. Pref.	16/6—18/6
2,528,714	,,	1/-	7½	South East'n Gas Cn. Ld. Ord.	14/—16/-
1,000,000	,,	-/10½	-/10½	Do. 4½ p.c. Red. Cum. Pref.	16/—18/-
1,068,869	,,	4	4	Do 4 p.c. Irred. Cum. Pref.	12/6—14/6
6,709,895	Aug. 5 '40	4	4	South Met. Ord.	50—55
1,135,812	,,	6	6	Do. 6 p.c. Irred. Pref.	76—81
850,000		4	4	Do. 4 p.c. Irred. Pref.	60—65
1,895,445	Dec. 29	3	3	Do. 3 p.c. Perp. Deb.	78—83
1,000,000	Jan. 12	5	5	Do. 5 p.c. Red. Deb.	100—105
1,543,795	Feb. 9	4	4	South Suburban Ord. 5 p.c	75—80
512,825	,,	5	5	Do. 5 p.c. Perp. Pref.	93—98
500,000	,,	4	4	Do. 4 p.c. Perp. Pref.	75—80
250,000	,,	3½	3½	Do. 3½ p.c. Red. Pref.	87—92
888,587	Dec. 15	3	5	Do. 5 p.c. Perp. Deb.	105—110
750,541	Feb. 9	2	6	Southampton Ord.	70—75
350,000	,,	5½	5½	Swansea 5½ p.c. Red. Pref.	93—98
1,076,495	,,	5	5	Tottenham & District Ord.	85—90
338,555	,,	5	5	Do. 5 p.c. Pref.	90—95
453,380	Dec 8	4	4	Do. 4 p.c. Perp. Deb.	85—90
1,247,505	Dec. 1	4	†4	U Kingdom Gas Cor. Ord.	15/—17/-
1,085,952	May 18	4½	4½	Do. 4½ p.c. 1st Cum. Pref.	16/—18/-
772,709	,,	4	4	Do. 4 p.c. 1st Red. Cum.Pref.	15/6—17/6
745,263	June 16	4½	4½	Do. 4½ p.c. 2nd Non.Cum. Pf.	14/6—16/6
1,200,000	Mar. 16	3½	3½	Do. 3½ p.c. Red. Deb.	87—92
380,606	April 27	6½	6½	Uxbridge, &c., 5 p.c.	95—100
1,371,138	Feb. 2	4	4	Wandsworth Consolidated	78—83
2,525,768		4	4	Do. 4 p.c. Pref.	74—79
1,343,964	Dec. 15	5	5	Do. 5 p.c. Deb.	105—110
383,745	,,	4	4	Do. 4 p.c. Deb.	85—90
558,342	Mar. 2	5	5	Watford & St. Albans Ord.	87—92
300,000	Dec 8	3½	3½	Do. 3½ p.c. Red. Deb.	84—89

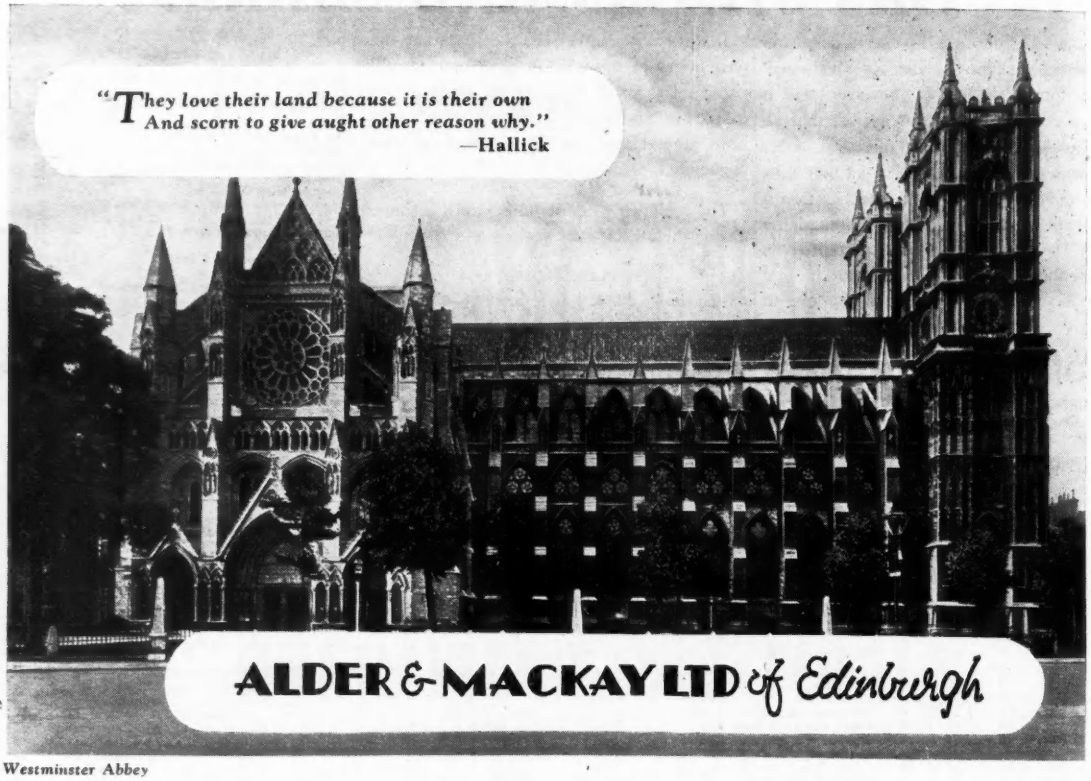
SUPPLEMENTARY LIST

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations May 28.
351,685	Dec. 15	5	5	Brighton, &c., 5 p.c. Perp. Deb.	105—110
415,250	,,	4	4	Bristol Gas Co., 4 p.c. New Deb.	95—100
140,205	Feb. 9	7	7	Cambridge, &c., 7 p.c. Cons. 'B'	105—110
295,932	Mar. 9	5	5	Cheltenham, 5 p.c. Cons.Ord.	83—88
42,500	Dec. 15	4	4	Do. 4 p.c. Perp. Deb.	82—87
150,000	Feb. 23	4	4	Croydon Gas, 4 p.c. Pref. (Irr.)	68—73
130,000	Dec. 29	4	4	Do. 4 p.c. Deb.	85—90
146,700	Feb. 9	5½	5½	East Surrey, 5½ p.c. Pref. 'A'	85—90
53,220	,, 10	6	6	Do. 6 p.c. Cum. Pref.	90—100
	Aug. 19 '40	6	4	Eastbourne, 'B' 3½ p.c.	37—42
239,135	Nov. 17	5	5	Gas Consolidation 'A' Ord. (£1)	11/6—13/6
156,600	Feb. 23	5	5	Hampton C't, 5 p.c. Cons. Ord.	75—80
18,000	Dec. 29	3½	3½	Malta & Med'n., 7 p.c. 1st Pref.	45—55
10,845	June 30 '41	3½	3½	Do. 7½ p.c. 2nd Pref.	35—45
50,000	Feb. 23	£5 4 6	£5 4 6	Mid. South. Util., 'A' Cons. 5 p.c.	70—80
65,000	April 27	5	5	North Middlesex, 5 p.c. Pref.	82—87
70,000	Mar. 9	5	5	Plymouth & Stone., 5 p.c. Deb.	103—108
76,501	Dec. 29	4	4	Reading, 4 p.c. Perp. Deb.	90—95
74,777	Sept. 30	4	4	Romford, 4 p.c. Debs. (Reg.)	90—95
21,000	Dec. 15	5	5	Slough, 5 p.c. Perp. Deb.	100—105
211,740	,,	5	5	Southampton, 5 p.c. Red. Deb.	95—100
363,575	Jan. 2	5	5	Tottenham, 5 p.c. Reg. Red. Mt.	102—105
202,019	—	—	—	Tunbridge Wells, 4 p.c. Scale	95—100
135,257	Dec. 8	5	5	Uxbridge &c., 5 p.c. Perp. Deb.	103—108

PROVINCIAL EXCHANGES

					Quotations May 22.
804,948	Mar. 2	5	5	Bath Cons.	95—97
122,577	Feb. 23	6	6	Blyth 5 p.c. Ord.	100—105
1,667,250	Feb. 23	5	5	Bristol, 5 p.c. max.	105—107
120,420	Dec. 15	4	4	Do. 1st 4 p.c. Deb.	101—103
415,250	,,	4	4	Do. 2nd 4 p.c. Deb.	100—102
328,790	,,	5	5	Do. 5 p.c. Deb.	114—119
157,150	Feb. 2	5	6½	Chester 5 p.c. Ord.	95—98
92,500	Dec. 15	4	4	Do. 4 p.c. Pref.	79—81
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	78—82
41,890	,,	4	4	Do. 4 p.c. Red. Deb.	96—100
542,270	Feb. 9	6	9	Derby Cons.	112—117
55,000	Dec. 16	4	4	Do. 4 p.c. Deb.	75—80
10,000	Aug. 11	10	10	Great Grimsby 'A' Ord.	155—165
6,500	,,	10	10	Do. 'B' Ord.	155—165
79,000	,,	10	10	Do. 'C' Ord.	145—155
732,000	Feb. 23	4	4	Hartlepool G. & W. Cn. & New	71—73
2,167,410	Mar. 2	6	6	Liverpool 5 p.c. Ord.	105—107
245,500	Dec. 15	5	5	Do. 5 p.c. Red. Pref.	99—101
306,083	Jan. 15	4	4	Do. 4 p.c. Deb.	98—100
20,000	June 23	5	5	Long Eaton 5 p.c. Pref.	9—11
80,000	,,	5	5	Do. 5 p.c. Deb.	87—92
2,430,267	Feb. 9	5	5½	Newcastle and Gateshead Con.	19/9—20/3
682,856	,,	4	4	Do. 4 p.c. Pref.	91½—92½
776,706	Dec. 29	3½	3½	Do. 3½ p.c. Deb.	86½—87½
277,285	Nov. 3	5	5	Do. 5 p.c. Deb. '43	99—101
274,000	March 17	5	5	Newport (Mon.) Ord.	86—89
13,200	Sept. 16	8½	7	Pontyp'l Gas & W. 10 p.c. A'	11½—12½
13,600	,,	6	5	Do. 7 p.c. 'B'	9½—10½
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½
106,280	Feb. 9	10	10	Preston 'A' 10 p.c.	152—162
188,219	,,	7	7	Do. 'B' 7 p.c.	111—121
1,806,339	Feb. 23	6½	6½	Sheffield Cons.	124—126
95,000	Jan. 5	4	4	Do. 4 p.c. Deb.	98—101
332,351	Feb. 16	6	6	Sunderland 6 p.c. max.	111—112
192,150	Feb. 9	5	5	Weston-super-Mare Cons.	94—98
64,338	Jan. 5	4	4	Do. 4 p.c. Deb.	85—90
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—145

a—The quotation is per £1 of Stock. * Ex. div. † Paid free of income-tax. †For year.


"They love their land because it is their own
And scorn to give aught other reason why."
—Hallick
ALDER & MACKAY LTD of Edinburgh

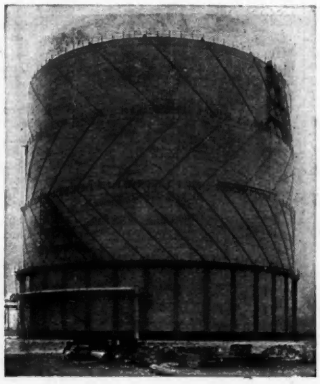
Westminster Abbey

SAML CUTLER & SONS, LTD

39 VICTORIA ST.
WESTMINSTER
LONDON, S.W.1

TELEPHONE—ABBEY 3121

TELEPHONE—RETORTUS, SOWEST, LONDON



GASHOLDERS

PURIFIERS CONDENSERS RETORT HOUSE EQUIPMENT
STEEL TANKS FOR OIL STORAGE & GASHOLDER PURPOSES
COAL AND COKE HANDLING PLANTS

483

CONTENTS

EDITORIAL NOTES

Under One Umbrella 403
Fuel Rationing 404
Voluntary Fuel Economy Campaign .. 404
Lighting Restrictions 404

Personal 404

Obituary 405
Letter to the Editor 405
The Policy and Scope of the Gas Research Board. By E. V. Evans, O.B.E., F.I.C. 406
Scientific Control in the Retort House and its Contribution to National Fuel Economy. By T. Campbell Finlayson, M.Sc., M.I.Chem.E. 408

Proposed Fuel Rationing Scheme .. 412
Bombay Gas Company, Ltd. 417
Replanning Gas Distribution. By G. G. Warne 419
Producer Gas for Road Transport .. 421

Gas Products Prices 423
Gas Stocks and Shares 423

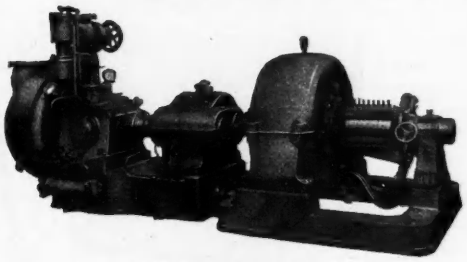
THIS WEEK'S ADVERTISERS

	PAGE
Alder & Mackay, Ltd.	424
Ashmore, Benson, Pease & Co., Ltd.	397
Ashworth & Parker, Ltd.	399
Bale & Church, Ltd.	425
Blakeley, Firth, Sons & Co., Ltd.	425
Boulton Tubular Structures, Ltd....	388
Boydell, E., & Co., Ltd.	389
Braddock, J. & J.	418
British Fittings Co. (Hendon), Ltd.	392
Broadbent, Thos., & Son, Ltd. ...	396
Brotherhood, Peter, Ltd.	401
Clayton, Son & Co., Ltd....	Cover IV
Cowan, W. & B.	Cover III
Cox & Danks, Ltd.	388
Crookston, S., & Co., Ltd. ...	425
Crossley Bros., Ltd.	388
Dempster, R. & J., Ltd.	385
Dempster, Robert, & Sons, Ltd.	410, 425
Donkin Co., Ltd. (The Bryan)	Cover II
Ellison Insulations, Ltd.	425
Gas Meter Co., Ltd. ...	Cover IV
Gas Purification & Chemical Co., Ltd.	425
Glover, Thos., & Co., Ltd.	Cover I, 402
Grant & West, Ltd.	426
Grant, David, & Co.	386
Griffiths Bros. & Co. (London), Ltd.	420
Harris & Pearson, Ltd. ...	Cover IV
Harrisons (London), Ltd.	426
Holmes, W. C., & Co., Ltd. ...	427
Horden Collieries, Ltd.	392
Humphreys & Glasgow, Ltd. ...	400
Institute of Chemistry	396
Jeavons, E. E., & Co., Ltd. ...	398
Jobling, James A., & Co., Ltd. ...	391
Keith Blackman, Ltd.	428
Kirkham, Hulett & Chandler, Ltd.	394
Main, R. & A., Ltd.	416
Mavitta Drafting Machines Co., Ltd.	396
Mewburn, Ellis & Co.	425
Ministry of Supply	387
Parkinson Stove Co., Ltd.... ...	413
Parkinson, W., & Co.	402
Peebles & Co., Ltd.	391
Pegson, Ltd.	Cover II
Radiation, Ltd.	414, 415
Rawlplug Co., Ltd.	399
Reavell & Co., Ltd.	425
Saunders Valve Co., Ltd.	425
Siebe, Gorman & Co., Ltd. ...	396
Slingsby, Walter & Co., Ltd. ...	396
Spencer (Melksham), Ltd. ...	424
Sternol, Ltd.	395
Strachan & Henshaw, Ltd. ...	425
Sutherland Meter Co., Ltd. ...	392
Technological Institute of Great Britain	425
Telegraph Construction & Maintenance Co., Ltd.	393
Trotter, Haines & Corbett, Ltd. ...	426
Visco Engineering Co., Ltd. ...	428
Wakelin, F. H., Ltd.	425
Walker, C. & W., Ltd.	386
West's Gas Improvement Co., Ltd.	422
Willey & Co., Ltd....	390
Woodall-Duckham Co.	409
Wright, Alex., & Co., Ltd. ...	395
Trade Cards	423
Appointments Vacant	426
Company Notices	426
Educational	425
Gas Undertaking for Sale	426
Patent	425
Plant, &c.	425
Plant, &c., For Sale and Wanted...	426
Publications	425

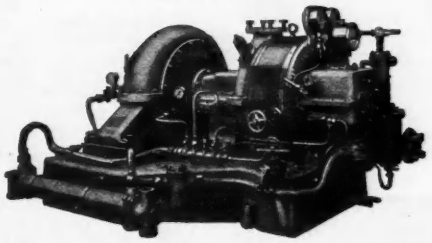
BROTHERHOOD
STEAM TURBINES FOR GASWORKS

Our Turbines, made for all powers up to 15,000 B.H.P. and for all conditions of service, are installed for driving Exhausters, Boosters, and Generators in many Gas Works, including:—

The Gas Light & Coke Co., South Suburban Gas Co., Wandsworth & District Gas Co., and in Works of Corporations and Companies at—Birmingham, Bristol, Coventry, Cardiff, Exeter, Liverpool, Manchester, Newcastle-on-Tyne, Preston, Portsmouth, Sheffield, Smethwick, Toronto, etc.



300 kW Back Pressure Geared Turbo-Generator.



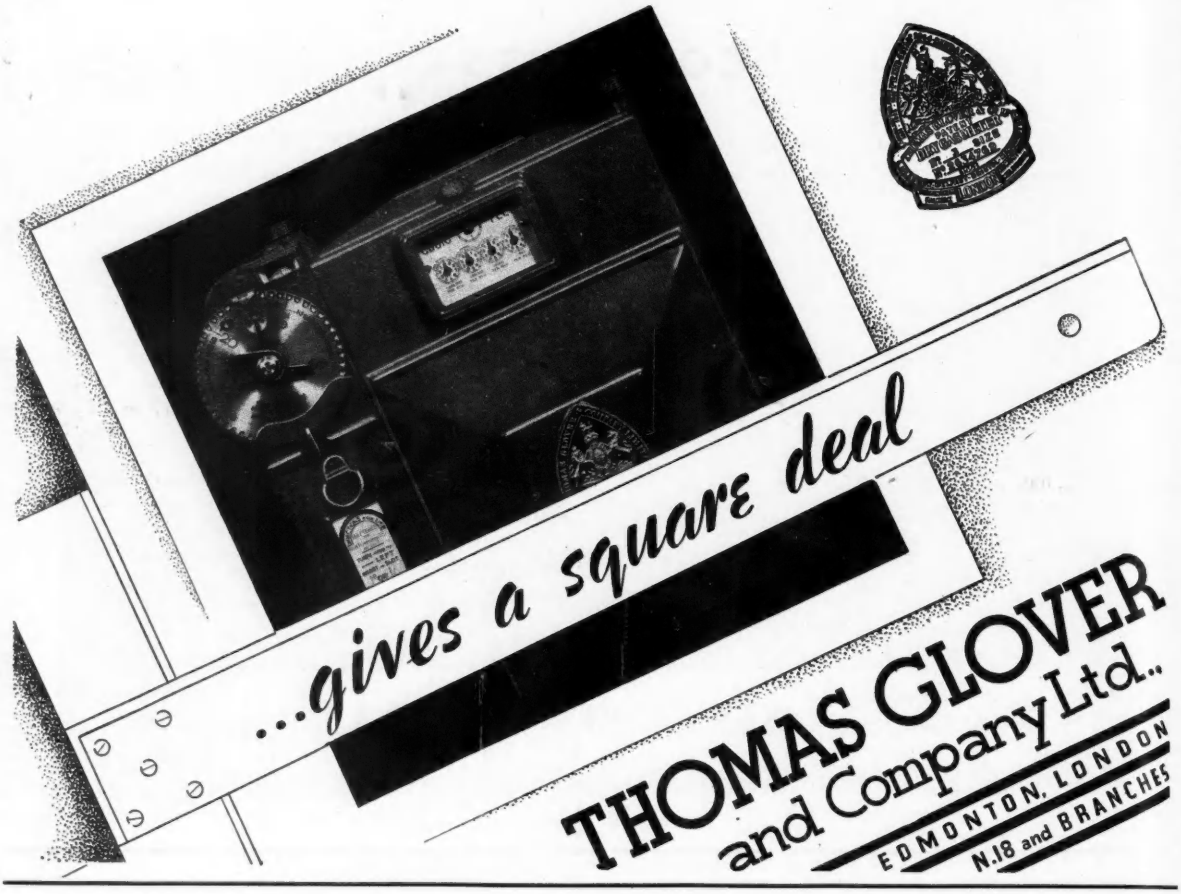
Exhauster driven by 150 B.H.P. Steam Turbine at 13,000 r.p.m.

Brotherhood plant for Gas Works also includes Reciprocating Boosters, Water Cooling Towers, Air and Gas Compressors for all pressures and capacities.

PETER BROTHERHOOD LTD

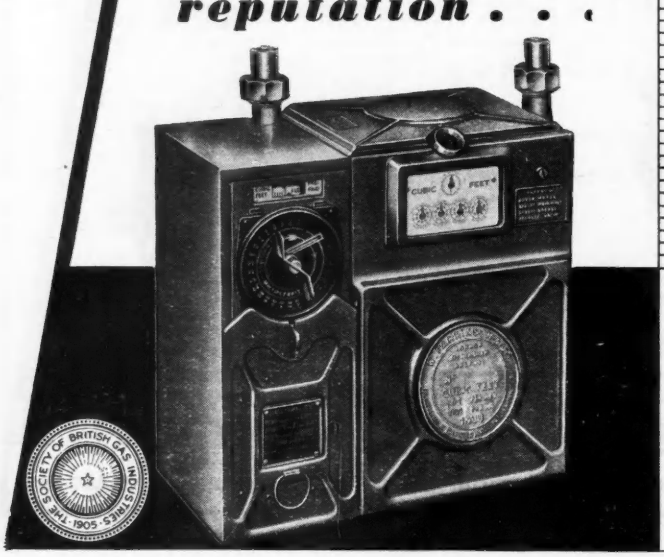
PETERBOROUGH :: Branch Offices in LONDON, LEEDS, MANCHESTER and GLASGOW

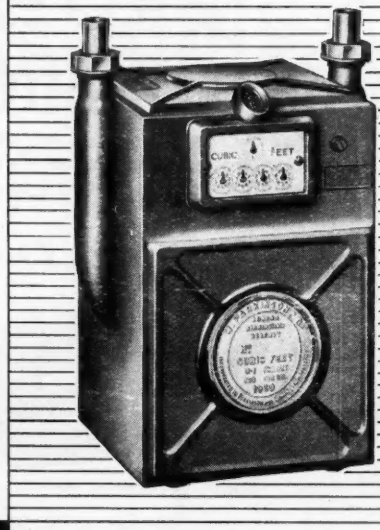
§§



PARKINSON

The Meter with over 125 years' reputation . . .





W. PARKINSON & CO.
(Incorporated in Parkinson & Cowan (Gas Meters) Ltd.)
ESTABLISHED 1816
COTTAGE LANE,
CITY ROAD, LONDON, E.C. 1
ALSO AT BIRMINGHAM AND BELFAST

p. 5